

# MILITARY REVIEW

VOLUME XXVIII

MAY 1948

NUMBER 2

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## CONTENTS

THE MILITARY RAILWAY SERVICE UP TO THE ITALIAN CAMPAIGN .....	Maj. Gen. C. R. Gray, Jr. USA	3
THE ARMY'S TECHNICAL DETECTIVES .....	Maj. F. M. Davis, Jr., Cav	12
LOGISTICAL PROBLEMS DURING THE GERMAN ARDENNES' OFFENSIVE .....	Col. W. Whipple, CE	18
SCIENTIFIC INTELLIGENCE IN MODERN WARFARE .....	Lt. Col. H. H. Rogers, Inf	27
ORDNANCE IMPROVISATION IN THE COMBAT ZONE .....	Lt. Col. J. D. Sams, OD	32
PERSONNEL ASPECTS OF MOBILIZATION PLANNING .....	Col. C. G. Follansbee, FA	37
COUNTERATTACK PLANS—A TECHNIQUE .....	Lt. Col. P. E. Smith, Inf	42
MILITARY PSYCHOLOGY—ADJUSTMENT .....	Chaplain (Major) A. C. Longley	47
REPATRIATION IN THE CHINA THEATER .....	Lt. Col. G. K. Cusack, FA	58
MILITARY NOTES AROUND THE WORLD .....		63
FOREIGN MILITARY DIGESTS .....		73
<i>Higher Training for Combined Command</i> .....		73
<i>The Battle of Moscow</i> .....		79
<i>Military Research in Sweden</i> .....		83
<i>Future Cooperation of the Armed Forces</i> .....		88
<i>Administrative Problems in Crete</i> .....		92
<i>Observing the Russians at War</i> .....		100
<i>Colombia's Air Force and Air Transport</i> .....		107
<i>Air Lesson in the Norway Campaign</i> .....		110

MILITARY REVIEW—Published monthly by the Command and General Staff College at Fort Leavenworth, Kansas. Entered as second-class matter August 31, 1934, at the Post Office at Fort Leavenworth, Kansas, under the Act of March 3, 1879. Subscription rates: \$3.00 (U.S. currency) per year; Additional charge for foreign postage of 50c per yearly subscription to all countries except those in the Western Hemisphere. Reprints are authorized, provided credit is given the "MILITARY REVIEW," C&GSC, Fort Leavenworth, Kansas.



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# THE MILITARY RAILWAY SERVICE UP TO THE ITALIAN CAMPAIGN

Major General Carl R. Gray, Jr., USA  
Director General of the Military Railway Service in World War II

*This is the first of two articles by General Gray. The second article will deal with the Military Railway Service in Italy and Northwest Europe and will be published in the June issue of the MILITARY REVIEW. General Gray recently succeeded General Omar N. Bradley as the Administrator of Veterans Affairs.—The Editor.*

**I**N the practical application of a service, such as the Military Railway Service, under battle conditions, a great many deviations from approved practices were necessary. It is my purpose to show how the system worked, rather than how it was supposed to work, and to renew the historical development of the authorities and responsibilities which were placed upon those of us in the service in order that they might be of benefit in future planning and operations.

Before we go into World War II conditions, let us bring up to date a little back history.

A writer said in 1914: "The extent to which railways are being used in the present war by the nations has taken us quite by surprise."

Our military historians, in their accounts of what armies have done or have failed to do on the battlefield in the past, have too often disregarded such matters of detail as how the armies got there, and the possible effect of good or defective transport conditions, including the maintenance of supplies and communications,

as they affected the whole course of the campaign.

Let us look into the record of various wars and find out how the rail transport of troops and supplies developed.

In 1830, on the opening of the Liverpool and Manchester Railway, a British regiment was moved thirty-four miles in two hours, as against two days of marching. Far-sighted army men then realized that the introduction of rail transport would have a powerful influence on future conduct of war.

## Early Developments

A German by the name of Frederick Wilhelm Harkort, who had participated in the Napoleonic Wars, came forward in 1833 with a plan to build a railway to connect the Weser with the Lippe and laid special emphasis on its value to Germany from a military point of view. Germany went forward in building its railways for military purposes, and forged far ahead of France, so that by about 1845 it had some 3,300 miles of railway, to only 1,000 in France.

In 1846, Prussia's Sixth Army Corps of over 12,000 men together with horses, guns, road vehicles and ammunition was moved on two lines of railroad to Cracow. In 1849, a Russian Corps of 30,000 men with all of its equipment was taken by rail from its cantonment in Poland to Goding, Moravia, to effect a junction with the Austrian Army.

The largest recorded movement of troops

by rail at this time was the movement of 75,000 men, 8,000 horses and 1,000 vehicles of the Austrian Army from Vienna and Hungary to the Silesian Frontier in the early winter of 1850.

It has been said that "such were the conditions under which the War of Secession in the United States was fought, that without the help of railways it could hardly have been fought at all." The area of military operations was so vast as to nearly equal the whole of Europe.

The North, bent not simply on invasion but on reconquest of seceded Southern States, naturally took the offensive. Commanders of field troops soon saw the paramount importance and necessity of railroads, so the Federal Government took possession of the Philadelphia-Wilmington-Baltimore Railway on 31 March 1861.

In January 1862, an Act of Congress entitled "An Act to authorize the President of the United States in certain cases to take possession of Railroad and Telegraph Lines and for other purposes" was passed. It provided that when so done, these lines "should be under the immediate control and supervision of the Secretary of War and such other agents as he might appoint."

#### Civil War Experience

Thomas A. Scott, Vice President of the Pennsylvania Railroad, was made Assistant Secretary of War, under Secretary Stanton, and together with other far-sighted men of that time, he made sure that this legislation, and the use of steam railroads was approved. Scott and Secretary Stanton selected Daniel Craig McCallum, who at the time of the outbreak of the Civil War was General Superintendent of the Erie Railroad, to be the head of the Military Railway Service, just then being organized.

It is most appropriate to see how definite they were in those days in issuing orders:

"Washington City, February 11, 1862.

"Ordered that D. C. McCallum be, and he hereby is, appointed Military Director and Superintendent of Railroads in the United States, with authority to enter upon, take possession of, hold and use all railroads, engines, cars, locomotives, equipment, appendages, and appurtenances that may be required for the transport of troops, army, ammunition and military supplies of the United States, and to do and perform all acts and things that may be necessary and proper to be done for the safe and speedy transport aforesaid. By order of the President, Commander in Chief of the Army and Navy of the United States, Edwin M. Stanton, Secretary of War."

#### Federal Operation

McCallum, who later became a general, actually took over for the Federal Government during the course of the war 2,105 miles of railroad.

One of McCallum's greatest troubles also confronted us in World War II—various gauges from narrow to six-foot. As General Superintendent, and later General Manager, he divided his forces into a Transportation Department and a Construction Department. In 1864, General McCallum was authorized to procure locomotives and cars by the following order:

"In order to meet the wants of the Military Department of the Government you will deliver to his order such engines as he may direct whether building under orders for other parties or otherwise, the Government being accountable to you for the same. The urgent necessity of the Government for the immediate supply of our armies operating in Tennessee renders the engines indispensable for the equipment of the lines of communication and it is hoped that this necessity will be recognized by you as a military necessity paramount to all other considerations—by or-



der of the President." It was signed by the Secretary of War.

Another order, designated as Special Order No. 337, dated at the War Department on 10 November 1862, could, and possibly should in different form, be utilized today. It reads as follows:

"Commanding officers of troops along the United States Military Railroads will give all facilities to the officers of the roads, and the quartermasters, for unloading cars so as to prevent any delay. On arrival at depots, whether in the day or night, the cars will be instantly unloaded, and working parties will always be in readiness for that duty, and sufficient to unload the whole train at once.

"Commanding Officers will be charged with guarding the track, sidings, wood, water tanks, etc., and within their several commands, and will be held responsible for the result.

"Any military officer who shall neglect his duty in this respect will be reported by the quartermasters and officers of the railroad, and his name will be stricken from the rolls of the Army.

"Depots will be established at suitable points, under the direction of the Commanding General, and properly guarded.

"No officer, whatever may be his rank, will interfere with the running of the cars, as directed by the Superintendent of the road.

"Anyone who so interferes will be dismissed from the service for disobedience of orders."

#### Importance of Railroads

The following quotation from "Recollections of Secretary Stanton," published in *Century Magazine* in March, 1887, shows how far railroads had gone in the conduct of war.

"The defeat of Rosecrans, at Chickamauga, was believed to imperil East Tennessee, and the Secretary of War was urged to send a strong reinforcement there

from the Army of the Potomac. General Halleck, Commander in Chief of the Army of the United States, contended that it was impossible to get an effective reinforcement there in time; and the President, after hearing both sides, accepted the judgment of Halleck. Mr. Stanton put off the decision till evening, when he and General Halleck were to be ready with details to support their conclusions. The Secretary then sent for General McCallum, who was neither a lawyer nor a strategist, but a master of railway science. He (Mr. Stanton) showed how many officers, men, horses, and pieces of artillery and how much baggage it was proposed to move from the Rapidan to Tennessee, and asked him (McCallum) to name the shortest time he would undertake to do it in if his life depended on it.

"McCallum made some rapid calculations, jotted down some projects connected with the move, and named a time within that which Halleck had admitted would be soon enough, if it were only possible; this time being conditioned on his (McCallum's) being able to control everything that he could reach. The Secretary was delighted, told him (McCallum) he would make him a Brigadier General the day the last train was safely unloaded; put him on his mettle by telling him of Halleck's assertion that the thing was beyond human power; told him to go to work and work out final calculations and projects, and to begin preliminary measures, using his (Mr. Stanton's) name and authority everywhere; and finally instructed him what to do and say when he (Mr. Stanton) should send for him by and by to come over to the Department. When the conference was resumed and McCallum was introduced, his apparently spontaneous demonstrations of how easily and surely the impossible thing could be done convinced the two skeptics, and the movement was ordered and made and figures now in military science as a grand piece of strategy."

What did this "grand piece of strategy" amount to?

It meant carrying 23,000 men and their equipment 1,200 miles in seven days!

McCallum's Chief of Construction, after Transportation and Construction had been separated, was Colonel Herman Haupt.

At the close of our Civil War, Germany, realizing the part played in that war by railroads, started her "Field Railway Section" of railway troops. France did likewise, and railways played a part in the war between France and Germany in 1870-1871. England also organized railway troops and used them in the Boer War in 1899-1902.

In almost every one of the cases cited above, as in the United States in 1917, these railway troops were a part of the Army's Corps of Engineers. At that time our basic authority lay in the Federal Laws and in the Army Regulations which said in effect:

"When the United States Government places an Army in the field, it shall be the duty of the Chief of Engineers to organize a Military Railway Service for the purpose of operating steam railroads in any theater of operation."

#### World War I

Now we come down to our day, and World War I, when the Military Railway Service really became a potent force.

In June 1916, when our troops were mobilizing on the Mexican Border, General William M. Black, then Chief of Engineers, realizing his responsibility and knowing that nothing yet had been done to provide efficient military railway service since the Civil War, decided to call on the railroads of the United States for aid.

On 24 June 1916, he asked S. M. Felton, President of the Chicago Great Western, to perfect an organization to maintain and operate railroads south of the Rio Grande. Felton was to be made Consulting Engineer

and Adviser to the Chief of Engineers.

The plan contemplated securing railroad officers to fill civilian positions, secure material to build 150 miles of railroad, and the personnel to maintain and operate it by the army on the border.

In two weeks all was ready, although the men and materials were never required. Mr. Felton, however, was asked to continue because of our possible participation in World War I. A study was made of the table of organization for a railroad regiment, and on 3 February 1917, there was authorized the organization of the 3d Engineers, afterward called the 13th, and it came from six Chicago railroads, one company from each. It was organized when we entered the war on 6 April 1917. General Order No. 61 War Department, 14 May 1917, authorized eight more railroad regiments, of which five were to be construction, three operating, and one shop. The plan was that the colonel and the regimental adjutant were to be Regular Army Officers, and the balance of the officers were to be selected from among railroad men.

#### Studies in France

France demanded help by this time for her railroads, so while regiments were being mobilized, a committee was sent to France to study their needs. That committee was headed by Major William Barclay Parsons, with Major William J. Wilgus, and W. A. Garrett and M. F. De St. Phalle of the Baldwin Locomotive Works.

General Pershing, by that time having arrived in France, held Major Parsons, who was to be Lieutenant Colonel, 1st Regiment, and Major Wilgus, and allowed now-commissioned Major Garrett and De St. Phalle to return home to report.

The following regiments were mobilized and sailed, from among many more:

The 11th, from New York, on 24 July;

The 12th, from St. Louis, on 28 July;

The 13th, from Chicago, on 22 July;  
The 14th, from Boston, on 29 July;  
The 15th, from Pittsburgh, on 9 July;  
The 16th, from Detroit, on 10 August;  
The 17th, from Atlanta, on 28 July;  
The 18th, from San Francisco, on 9 August;  
The 19th, from Philadelphia, on 9 August.

Felton was then given the title of Director General of Railways, but by 27

The first request for locomotives from abroad was for 300. They were of a consolidation type of 35,600 pounds tractive effort, and weighed 166,400 pounds, and had a 21 x 28 cylinder and a 56-inch driving wheel.

The Baldwin Works were ordered to devote their entire capacity to standard gauge locomotives for overseas. The American Locomotive Company's engines were wholly for home service.



Training replacements for railway operating battalions.

December 1917 it had to be changed to Director General of Military Railroads when the President took over all the railroads in the United States.

Felton's office started with one engineer officer and three clerks, and expanded to 102 officers, 118 enlisted men, and fifty-seven civilians.

One of their noteworthy accomplishments was to standardize, as far as possible, all railroad equipment, speed production and reduce costs. It is estimated that a saving of over \$33,000,000 resulted from that general policy.

The first engine was turned out in twenty working days, and the final capacity was at the rate of 300 engines per month. Thirty-four hundred were under order.

#### Affiliation Units

After the Armistice on 11 November 1918, and with the passage of the National Defense Act of 1920, there came into being a skeletonized force for Military Railway Service troops on an affiliation basis with the railroads of the United States, in which key officer personnel were

assigned within the battalions to positions comparable with their civilian positions on the railroads. Appropriations, however, were reduced and to my best knowledge and judgment there was no training to amount to anything in connection with these troops after 1919. Many vacancies in the commissioned strength of these units occurred because there was no one particularly interested in keeping them up to strength, and with no provision for training or mobilization there was not too much interest shown among the officers who had been assigned.

#### Developments Between Wars

From 1922 to 1925, I had discussed the size of a Military Railway Service basic unit with Generals Smith and King, then Commandants at the Command and General Staff School, and I indicated at that time that, in my belief, the regiment was not the proper organization, but that the basic Military Railway Service unit should be a battalion, and that it should correspond in balanced strength to a division superintendent's office and force on a standard American railroad.

The Reserve Corps, through lack of appropriations, was not a very potent force for the next eighteen or twenty years, and it was not until the fall of 1938 that Colonel J. J. Kingman, CE, was appointed Assistant Chief of Engineers with the rank of Brigadier General. In Washington he found that the Military Railway Service had fallen to less than nothing, and he set about to correct that improper situation. He asked me to become a consultant in the program which he had in mind to bring a basic organization of the Military Railway Service into being. I agreed and as of 1 February 1939, was assigned as General Manager, Military Railway Service, reporting to the Chief of Engineers.

A section of the office of the Chief of Engineers was organized as the Military Railway Service branch. Two rail-

road men, Colonel C. D. Young, Vice President of the Pennsylvania, and I thus became consultants to the Chief of Engineers on the Military Railway Service, and it was then planned that in case of war Colonel Young was to take over the staff work in the Chief's office, and I was to be the commander in the field. It would take too long to tell of the developments which occurred between then and 7 December 1941, but briefly there were set up tables of organization and equipment to cover the Military Railway Service, and the organization in general was to be composed of Engineer Headquarters, Military Railway Service, corresponding to a General Manager's office on a standard American railway; Railway Grand Division Headquarters, corresponding to the Headquarters of a General Superintendent; Railway Operating Battalions, corresponding to a Division Superintendent's organization; and Railway Shop Battalions corresponding to the back shops, both steam and Diesel, on an American railroad. It was concluded that the field organization would not place less than two, or more than five Railway Operating Battalions under a Railway Grand Division, and would add to the Railway Grand Division at least one Steam Railway Shop Battalion, and if Diesel power was used, one Diesel Railway Shop Battalion.

Before the war there were authorized this Engineer Railway Headquarters and ten Railway Grand Division Headquarters, forty Railway Operating Battalions, and ten Railway Shop Battalions, all on the affiliation basis and each sponsored by a railroad which would furnish the commissioned personnel and enlisted cadre as contemplated by the tables of organization and equipment. Ultimately, 43,000 commissioned officers and enlisted men composed the Military Railway Service in World War II.

#### Under Transportation Corps

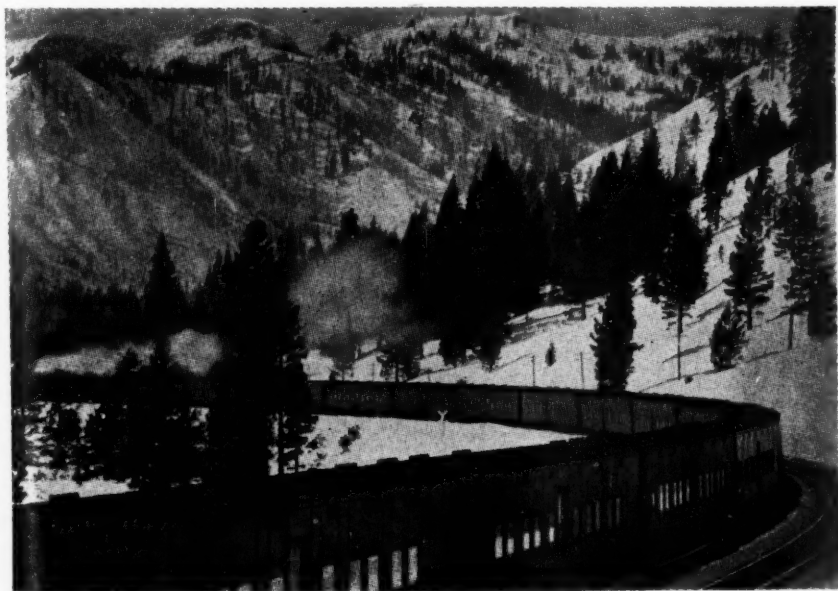
By General Orders No. 60, 15 November

1942, the Military Railway Service, intact, was transferred to the newly created Transportation Corps where it is at the present moment.

Prior to the Pearl Harbor attack it had been decided to establish a railroad on which training could be more properly given. Therefore, negotiations were entered into by the government to secure control of the Red River and Gulf Rail-

Operating Battalions in 1943 and 1944.

Units began to be called into active service as of 15 April 1942. In January 1942, a contract had been entered into between the railroads, represented by the Association of American Railroads, and the Government, represented by the Chief of Engineers, by which these various units sponsored by individual railroads would be trained on their respective rail-



A train of Government-owned troop sleepers.

road, a logging railroad connecting with the Missouri Pacific just south of Alexandria, Louisiana, at a point which subsequently became the location of Camp Claiborne. By that time, Camps Claiborne and Polk had been authorized, and the 711th Railway Operating Battalion was moved there. It later built the Claiborne & Polk Railroad connecting the two camps. Subsequently, this railroad was used as a training ground for several Railway

roads in a technical sense after they had secured their basic military training at some army camp.

The first unit to be called into active service was the 727th Railway Operating Battalion which was activated 15 March 1942, and trained on the Southern Railroad between Meridian and New Orleans. Then, on 15 April 1942, came the 713th which trained on the Santa Fe at Clovis, New Mexico, and the 753d Railway Shop

Battalion which trained in the New York Central Shops at Bucyrus, Ohio. On 15 May 1942, came Headquarters, 1st Military Railway Service, which trained in the railroad center of St. Paul, Minnesota; and the 730th Railway Operating Battalion, which trained on the Fort Wayne Division of the Pennsylvania Railroad. On 1 August 1942, the 703d Railway Grand Division which came to St. Paul was activated and trained in company with Headquarters, 1st Military Railway Service. The 703d Railway Grand Division was, therefore, organized about 1 September 1942, to consist of the 713th, 727th, and 730th Railway Operating Battalions, and the 753d Railway Shop Battalion.

Subsequently, and as fast as authorized additional units of the Military Railway Service were activated, officers trained a month to six weeks in Transportation Corps schools, and then the unit was activated and placed in training on some railroad. An attempt was made to call in units to active service in order that they might locate on the various established training areas on railroads without having too many battalions training at one time and to minimize the cost of construction camps. The General Manager, Military Railway Service, acting for the Chief of Engineers until 15 November 1942, and for the Chief of Transportation subsequently, was charged with the planning and training of these railway troops as they were called into active service.

#### Movement Overseas

The first troops actually sent abroad were in a Provisional Battalion known as the 770th which took over, on 1 October 1942, the operation of the White Pass and Yukon Railroad in Alaska. The 703d Railway Grand Division was set up and accompanied General Patton as part of his Western Task Force that landed at Casablanca in the fall of 1942.

Now let us follow subsequent develop-

ments in the Mediterranean and European Theaters of Operations. After the Casablanca Conference, General Somervell ordered the General Manager of the Military Railway Service to be flown to Algiers with a maximum of twenty-five officers and enlisted men as a forward echelon of Headquarters, Military Railway Service. This group arrived in Algiers in February 1942.

#### North Africa

Upon our arrival in Algiers, I was placed in charge of all Allied military railways in North Africa and given definite instructions as to what my authority and duties would be. I was made responsible for the technical development and operation for military purposes of all railways in the North African Theater, and required to make recommendations to the Chief Administrative Officer as to the extent to which such development and operation should be carried out through the medium of the French railway service, or by United States or British military personnel.

On 8 July 1944, General Orders No. 17 changed this order to make the Director General responsible for the technical development and operation of railways in the Mediterranean Theater, except in North Africa. In the latter area, rail movements became the responsibility of the Commanding General, North African District, and the Commanding General, SOS, NATOUSA.

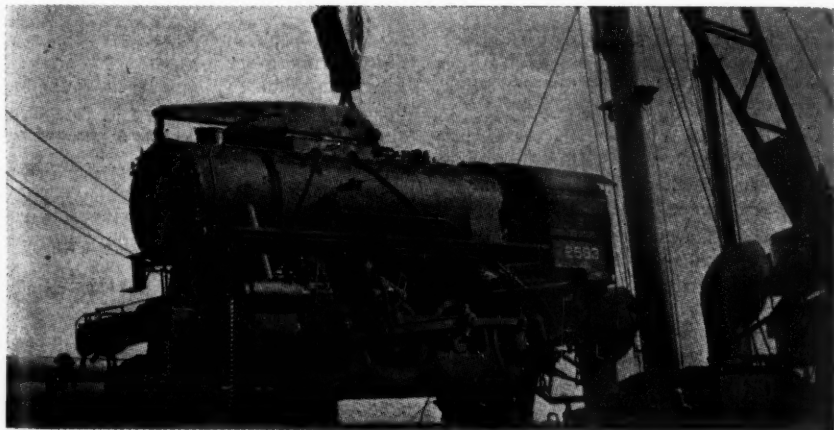
Another order made the Director General responsible to the Deputy Theater Commander for the training, as well as the welfare and discipline, of United States military railway troops.

Special conditions existing in Southeastern Algeria and Southern Tunisia made it necessary, by 10 April 1943, to clarify authorities and responsibilities, which was done by Memorandum No. 4, HQ, NATOUSA. Under this memorandum, construction, maintenance and repair of military



railways were planned for and performed under direction of the Director General. Such work in the Combat Zone was directed to be performed by American and British troops assigned to him with the senior tactical commander furnishing assistance for work which was beyond the limits of the assigned troops. Outside the Combat Zone, extra help was authorized from Allied Force Headquarters for

transportation to the Allied Armies in North Africa and subsequently in Sicily. Troops under his command had increased so that there were now Headquarters, 1st Military Railway Service, three Railway Grand Division Headquarters, five Railway Operating Battalions, one Railway Shop Battalion, one Railway Transportation Company (all U.S.); and two Railway Operating Groups, plus three En-



Loading locomotive for overseas shipment.

British assistance, and the Commanding General, SOS, for American assistance. Railway stores and equipment were furnished through Services of Supply, North African Theater of Operations.

Previous to 19 October 1943, units of the Military Railway Service were attached to armies and base sections for supply and administration, but an order of NATOUSA that date attached them for supply only.

Under the provisions of these orders, the Director General, Military Railway Service, reporting to the Commanding General, AFHQ, continued to supply rail

engineering Groups of the British Transportation Service in the Mediterranean Theater.

The railroads under our operation extended eastward from Oran to Tunis, and included a meter-gauge railroad from Ouled Rhamoun to Sousse.

For the invasion of Sicily, the Director General provided one Railway Operating Battalion (the 727th), for support of the U.S. Seventh Army, and one Railway Operating Group (British Transportation) for support of the British Eighth Army. These units operated in Sicily under the provisions of the orders indicated above.

# The Army's Technical Detectives

Major Franklin M. Davis, Jr., *Cavalry*

SOMEWHERE in Germany a man finds two billion dollars in a rubble heap. A cable goes to Washington and the course of our battle in the Pacific is changed.

Startling? Not necessarily—it is just one of the many factors introduced into our national economy by FIAT (Field Information Agency Technical), the United States Army's scientific and technical mission in occupied Germany.

The two billion dollars was in the form of a complete German-developed synthetic rubber process, worked out to the last degree by Hitler's scientists in the early part of World War II. The cable to Washington permitted Congress to cancel a two billion dollar appropriation for similar research in the United States and at the same time Pacific operations were shifted because rubber requirements were thereby taken off the top-urgency list.

The find in the rubble heap was not a matter of chance. The chain of events leading up to that particular discovery began in prewar years when an offhand remark by a tourist enabled a United States military attaché in Germany to get a lead which eventually was transmitted to a technical intelligence target designation in the files of G-2, Supreme Allied Headquarters, where FIAT had its beginnings.

The man who found the process was a FIAT investigator, a technical expert on synthetic rubber shipped to Germany for the express purpose of finding that par-

ticular information. These investigators, representing every phase and nuance of American industry, have been funneling through FIAT at the rate of 375 a month during the past two years of occupying Germany.

FIAT closed its operations in Germany in the summer of 1947, writing the end to one of the most spectacular chapters of the Occupation, and putting the lid on the crate of the richest military trophy in history.

## German Technical Resources

In spite of the fact that Germany was considered a "have-not" nation, her ability to wage machine war for five years emphasizes the depths of her technical resources. The Allied nations knew Germany was knifing through scientific and industrial problems and puzzles with the same fanatical zeal and early success German troops showed on the battlefield. But it was not until the entry of our troops into Germany that the extent and scope of German technical research could be checked and examined.

The Technical Intelligence "T" Subdivision of General Eisenhower's G-2 Division handled these scientific investigations during the war, and many a combat veteran recalls the close-mouthed soldiers wearing the big red "T" on their steel helmets standing silent guard on battered buildings from Cologne to Dessau. On VE-day, our search for military informa-

tion on V weapons, jet propulsion and radar, for use against Japan, swung into high gear, and priority results rushed back to Washington included German defensive weapons like an infra-red radar substitute developed to thwart Allied radar jamming, and "the waterfall," a proximity-type antiaircraft rocket capable of exploding a few feet from a target plane after tracking it within a mile range. A special grease designed to absorb radar when spread on submarines had already been sent to Japan by the time the United States discovered it in Germany.

After Japan's fall, emphasis shifted to a more widespread investigation of German science and industry. When Supreme Allied Headquarters closed, the technical intelligence mission for the United States passed on to a small group of army officers and enlisted men, who, by virtue of previous experience, interest, or the vagaries of army assignment, were combined with United States Department of Commerce field representatives in executing Presidential directives to get information out of Germany.

#### Allied Benefits

This systematic combing of Germany's war science was an Allied project, and the United Nations have received copies of 700,000 German patents and an estimated million tons of significant documents. Among the more important discoveries were the following: complete information on the new science of acetylene synthesis; a German long-range photographic process so accurate that German cross-channel photographs of British radar installations were detailed enough to determine British radar frequencies; data on synthetic fiber developments in polyurethanes that may put nylon stockings in a class with lisle hose; the world's largest hydraulic press—30,000 tons pressure—an *I.G. Farbenindustrie* development for German aircraft manufacture; records on use of low-grade ores in scarce alloy substitutions; a ma-

chine for converting sea water to fresh water, of 60 per cent less over-all weight and a capacity of thirty tons fresh water per hour over any existing machine; outstanding developments of cold-drawing steel that eliminate expensive casting and machining; a new magnesium welding flux; special extreme-cold automotive fuels; high-speed supercharged aircooled diesel engines; a blast-furnace boiler of radical new design of 70 per cent less weight, and efficiency equal to conventional designs; and the famous Fischer-Tropsch synthetic gasoline process based on coal hydrogenation.

All these discoveries were turned in by FIAT investigators beating their way up and down the cobbled roads and dirt trails of Occupied Germany.

#### Exchange of Information

Although the FIAT combination of Army and Department of Commerce talents was purely an American enterprise, exchange of information is being effected through joint Allied operations and trading of investigators. The British and French Occupation Forces maintained liaison detachments with FIAT, but the Russians eye the whole business with skepticism and distrust, particularly United States-British efforts. The Moscow newspaper *Trud* as quoted on 26 February 1947 by the *Berliner Zeitung* published in the Russian sector of Berlin, claimed that British-American monopolies were attempting to take advantage of the postwar situation in Germany to seize German patents. "It is obvious," *Trud* is quoted as saying, "that utilization of German inventions and scientific discoveries may net American industrialists returns into millions, perhaps thousands of millions, of dollars . . . while the press bandies rumors about a possible waiving of reparations claims."

The Russians, in asking for German reparations at the Moscow Conference, put their cash value of the FIAT effort at ten billion dollars.

As our Moscow reply stated, the United States has removed no patents, plans, processes, or records from Germany. All information is either copied or obtained by investigation and is sold by the Department of Commerce to Americans and Allies at the cost of reproduction. The individual, the small business, and the giant corporation get equal benefit.

Indeed, some of the most significant discoveries have come from joint operations with other interested occupying powers. The *I.G. Farbenindustrie*, biggest cartel the world has ever seen and currently the target of quadripartite decartelization, had four mammoth plants in Germany. The factories in Hoechst in the U.S. Zone, Luverkusen in the British Zone, Ludwigshafen in the French Zone and Bitterfeld in the Russian Zone, were controlled by top *I.G. Farbenindustrie* research committee, commissions, and bureaus.

#### Widespread Influence

So widespread was the influence of this firm, and so detailed was the research in its four plants, that it is hard to find a phase or angle of world economy that was not a subject of interest, discussion and investigation at *I.G. Farbenindustrie*. The plans, records and project lists of these top commissions were a closely guarded German secret. FIAT and other United Nations exploitation agencies have come up with 36,000 pages of documents—a fraction of the total—which give the world the first detailed inkling of what this scientific octopus was doing. The minutes, proceedings and journals of high German committees show that *I.G. Farbenindustrie* research and development interest covered the widest possible range of chemical, pharmaceutical, fuel, metal, plastic, electronic, and synthetic production.

FIAT's search has placed special emphasis on German synthetics. Denied many normal imports, Germany explored the hidden realms of coal and acetylene synthesis, pouring billions of reichmarks into

processes for synthetic gasoline and oil. German *ersatz* mica, accepted for real mica when the first sample was examined at the United States Bureau of Standards, was made from mixed oxides, fluorides, and silico-fluorides. An artificial fur, each hair coated with a substance made out of sodium bicarbonate and citric acid, made a marvelous emergency sea-suit for downed German fliers. An egg-white, developed from codfish and shrimp, shows a 94 per cent protein value. Periston, the German name for polyvinyl pyrrolidone, is an artificial blood plasma now under further study in the United States.

Other FIAT discoveries like marfanil, a sulfa product for gas-gangrene treatment; gesarol, a contact insecticide slightly less effective than DDT; and typhus and malaria drugs, are under analysis and study in British laboratories.

German test-tube ingenuity worked overtime for Hitler but FIAT investigators have been even more perservering and tireless in their efforts. Nine thousand investigators have made 5,000 trips through the Occupied Zones, and 28,000 reports are available to American private industry.

#### Unique Mission

FIAT had a mission never assigned before to a body of troops in military history, and although other FIAT discoveries have been given a certain guarded publicity, the actual process of the scientific exploration of an enemy country has never been mentioned.

Operating with the Office of Military Government in Germany, FIAT used a relatively small group of personnel to track down vital data. The Technical Industrial Intelligence Division (TIID) of the Department of Commerce in Washington maintained a group of industrial experts as counterparts for FIAT industrial expert committees in Germany. The Army handled policy, processing, and the servicing of personnel, but the technical ex-

perts were obtained through the Department of Commerce.

The TIID committees maintain a running survey of existing reports, records and documents shipped to Washington by the Army. This survey shows, for example, that we need much more information on precision optical instruments. Arrangements are made through an American optical plant to send a qualified representative to Germany as a FIAT investigator. A plant engineer or an executive vice-president is selected. He proceeds to Washington, where he confers with TIID officials, is briefed on his investigation, and placed aboard a plane for Germany.

#### Method of Operation

Shortly the expert sits down at the Rhine-Main airport in Frankfurt, where a FIAT Army representative meets him and takes him to FIAT headquarters in Karlsruhe, ninety miles south on Hitler's autobahn from Frankfurt. Upon arrival at FIAT headquarters, he is passed to the Department of Commerce sub-committee covering precision optical instruments.

Here he is briefed again. Old FIAT reports, copies of German drawings and diagrams, advice and suggestions are placed before him. He may spend a couple of days becoming thoroughly oriented. After learning what has been attempted, what has been uncovered, and what he may expect, he decides to visit a German optical plant.

The German precision optical industry, so famous that Leica and Zeiss are common words the world around, is currently split in Occupied Germany. The Ernst Leitz plant, makers of Leica cameras, is in the United States Zone at Wetzlar, while the Zeiss works, home of the Carl Zeiss microscope, is situated at Napoleon's old battlefield of Jena in the Russian Occupied Zone.

The Leitz plant has been pretty well covered by previous investigations, and it takes from two months to a year to get

clearance from the Russians to enter the Zeiss plant at Jena. So the investigator decides to check a new target, the *Optiker Gesellschaft A.G.* in Warburg, a small optical firm doing contract work for Zeiss in the pre-war years. An interview by another FIAT representative with a German scientist in Berlin has disclosed that *Optiker Gesellschaft* may have developed a new lens coating supposedly far in advance of any lens coating known in the United States.

The optical expert makes arrangements through FIAT contacts for an occupational area pass which permits him to make the technical investigation. Arriving at Warburg, he finds that *Optiker Gesellschaft* occupies about twenty acres, that four chimneys out of six are smoking, and that "Off Limits" signs are plastered liberally along the building.

Inside the plant he meets *Optiker Gesellschaft* officials and displays his pass. In the course of the conversation he senses a certain shade of hostility, indefinable, but nevertheless there.

#### Difficulties Experienced

The plant manager is not reluctant to show him through the factory, but there is little to see. Lens grinders are doing routine work, simple microscopes are being assembled. The investigator spends the day poking about the plant, quizzing workers, probing files, but there is no evidence of any new lens coating projects. Finally he abandons the subtle approach and directly asks for information about the new lens coating.

The plant manager looks surprised and claims the plant has done no work in lens coating for over seven years. He questions the right of the investigator to take pictures. The lens coating information is still not forthcoming. But the investigator is determined to find the information if it is there. Leaving the plant, he goes to the office of the *Burgomeister*, where he gets the home address of the plant man-

ager. He drives down a blasted street, locates the address, and parks his car some distance from the house.

A few judicious inquiries in the neighborhood, and he finds that men work in the plant manager's cellar. Men have been seen going in and out with boxes and crates, and there is every indication of extra activity that may be the lens coating project.

The investigator then returns to the plant and accosts the manager. "Look, you either let me into your cellar and show me what you've got there in your house or I'll bring in the army and we'll go in and take it. Make up your mind."

The manager gives in. Five workers are laboring on a new lens coating in the cellar of the manager's home; complete charts, records and samples are available. The investigator gets busy with his camera and buys some sample lenses, paying the manager's price in *reichmarks*.

No action is taken against the plant manager; no drastic effort was necessary to get the information. The plant manager's reluctance was typical of many German workers and factory owners who fear the fruits of their work will be taken away entirely.

#### Report of Investigation

So, the investigator returns to FIAT in Karlsruhe where he writes a detailed report of what he has found. His report goes through local FIAT editing, is filed in the FIAT records library where Army personnel give it a Library of Congress processing, and a copy of the report is passed to the Department of Commerce in Washington. Here the Office of Technical Services lists the report as available for the public in its weekly "Bibliography of Scientific and Industrial Reports."

All United States industry gets the benefit of the trip to Germany. The investigator himself has the information first-hand. The cost to the taxpayer is nothing, because investigators who are

handled this way travel without compensation. The pay and incidental expenses of such investigators are borne by their respective companies.

Besides processing investigators, the permanent FIAT party handles another phase of Germany's technical exploitation.

#### Publications Board

This second phase, known as the Publications Board program, is the sorting, classifying, evaluating, and recording of all German documents of interest to American industry. Based on technical intelligence target lists, requests, reports, and information obtained from war information, special searches, State Department and United States industrial sources, the records, flow charts, process sheets, project titles, patent applications, and patents of every industry in Germany are sifted. A team of screeners who are qualified experts descend on a factory. Here all documents, including papers hidden by crafty Germans in such unlikely places as down manholes and up chimneys, are examined. Furniture inventories, property receipts and pay vouchers are separated from vital technical data.

Then a microfilm team, complete with microfilm camera, numbering machines, floodlights, extra power unit, and transportation, moves in. Every page selected by the screeners is recorded on microfilm. The completed microfilm reels—1,200 pages to the reel—are sent back to FIAT in Karlsruhe. Here Army personnel print the film and examine it for flaws and illegibility. Re-take schedules are sent back to the target, the retakes spliced into the reel, and the completed film sent through a processing section where brief abstracts, condensations, or translations are made in English. These, with the completed microfilm are returned to Washington where they are listed in the Office of Technical Services bibliography and sold to private industry. Price to the public is on a cost basis; microfilm, depending on the number



of pages filmed, sells from fifty cents to \$80.00; reports, mimeographed or printed, cost from ten cents to \$2.00.

Some FIAT results are insignificant, others of vast importance. One investigator uncovered the most striking optical principle discovered in the last fifty years. Known as the Zernike principle and utilizing a phase diaphragm instead of the iris diaphragm of ordinary microscopes, this new development slows down parts of the light wave passing into a phase microscope. This permits for the first time in optical history the microscopic study of organisms without first killing and staining them.

The magnetophone, a German product uncovered by FIAT, is at the moment threatening the lucrative United States wax record industry. This device uses a magnetized plastic tape to effect exceptionally high-fidelity recordings. Both recordings and playbacks can be made on the same tape. The plastic tape can be used and re-used almost indefinitely and is so thin that a mile of it can be wound on a reel in little over an hour.

#### Undetermined Value

The value of all this to the average citizen is yet to be established. It is certain that FIAT discoveries in Germany, as well as German pathfinding now in the laboratories of American industry, will total a tremendous sum cut from production costs. The saving of national resources as well as research time and expense is incalculable.

Effects will vary. The spectacular German color film that allows direct negative to positive printing by using three emulsions on one film as opposed to the present United States process of using three nega-

tives for each positive print, will put better and more sensitive color film into post-war cameras. The German broadband underground cable for long-distance television piping may point the way to a solution of current United States television difficulties; the use of radio links instead of wire for tele-printing and voice transmission in German commercial radio will boost American commercial development. Hundreds of new dyestuffs will revolutionize American textiles, and their impact on the fashion world is not far off. The German war-developed ionized air treatment for sinus ailments is a boom to thousands of American sufferers. The Third Reich's synthetic jewel and industrial stone industry, long a carefully guarded secret has pointed the way for synthetic aquamarines, topazes, sapphires and rubies so realistic they cannot be distinguished from real stones except under a microscope.

This careful culling of German industry has by no means escaped the notice of the German populace at large. Many a scientist attempts to bargain. "Patent thieves," "brain-looters," "crooks" are some of the epithets flung in anonymous letters or picked up in censorship checks. Other Germans are anxious to get back to work in their respective fields, and such is their scientific detachment that it appears to make little difference whether the work is done for Germany or for the Allies. In any event, the frantic drive flung into the German war effort by Hitler's scientists is being turned to our national advantage—and it costs the taxpayer no more than it costs to maintain a single infantry company.

# Logistical Problems During the German Ardennes Offensive

Colonel William Whipple, *Corps of Engineers*

THE main operations during the great Battle of the Bulge are fairly well known and certain aspects are famous, such as the defense of Bastogne by the 101st Airborne Division and its relief by Third Army. Certain logistical problems which arose at this time, however, are not generally known except to those directly concerned, although they had quite an influence on operations, and under certain circumstances might have had much more.

The general situation on 16 December, at the start of the German offensive, was as shown on Figure 1, with the British Twenty-First Army Group in the north, supplied by their own lines of communication, and the United States Twelfth Army Group, composed of Ninth, First and Third Armies, successively to the south. During the preceding two months there had been relatively little advance of the Allied Armies north of Luxembourg, and during the latter part of that time the provisions for supply and administrative support had been much improved. However, certain serious potential weaknesses existed in the logistical picture.

## General Supply Situation

The operations of August and September, which at first were based on Cherbourg and the Normandy beaches, had uncovered successively the Seine ports, the Brittany ports, the Channel ports, and finally the great Belgian ports of Antwerp and Ghent. Unfortunately, although Ant-

werp was entered on 4 September, and was secured with harbor and dock facilities intact, German forces continued to hold the island of Walcheren which covered the approaches, and the port was not opened until 29 November.

As of 7 November, for example, 17,000 tons daily of U.S. supplies still came from Cherbourg, and the minor ports and beaches in the Normandy area, and the balance of 9,000 tons daily came through the Seine ports. These supplies were processed through the base depots and dumps, many in the beach areas and others along and south of the line: Paris—Reims. The bulk of the supplies for the United States First and Ninth Armies were shipped from these base depots to Advance Section, Communications Zone (AdSec), and Army depots in the Liege-Namur area, which were grouped well forward and as far to the north as possible. This location of depots was designed to facilitate subsequent operations towards and to the north of the Ruhr.

The Ardennes area itself had few facilities suitable for storage, and troops in that area were spread so thin that requirements were low. Third Army troops were supplied by the southern sector of AdSec, over lines of communication south of the Ardennes. Sixth Army Group had its own separate line of communications from the Mediterranean (SOLOC) which was substantially independent of Communications

Zone, both physically and from the standpoint of command and administration. Its advance section was CONAD, Continental Advance Section.

British forces, with a total of eighteen equivalent divisions, kept administrative control of almost the entire coastline they had uncovered, except that U.S. Forces used port facilities at Le Havre and Rouen. The British "Rear Maintenance Area" remained in Normandy near the original beaches. Intermediate ports, including Dieppe, Boulogne and Ostend, were opened up to the extent necessary to compensate for loss of beach capacity; but the British plan continued to be to keep their base of supply in Normandy until transferred to the general area: Antwerp—Brussels—Ghent, which had port capacity, accommodations, and a transport net adequate to support a much larger force than Twenty-First Army Group. However, even after the opening of Antwerp, the British were by no means anxious to make the transfer of their lines of communication and bases, largely on account of the continued attacks on Antwerp by V-weapons.

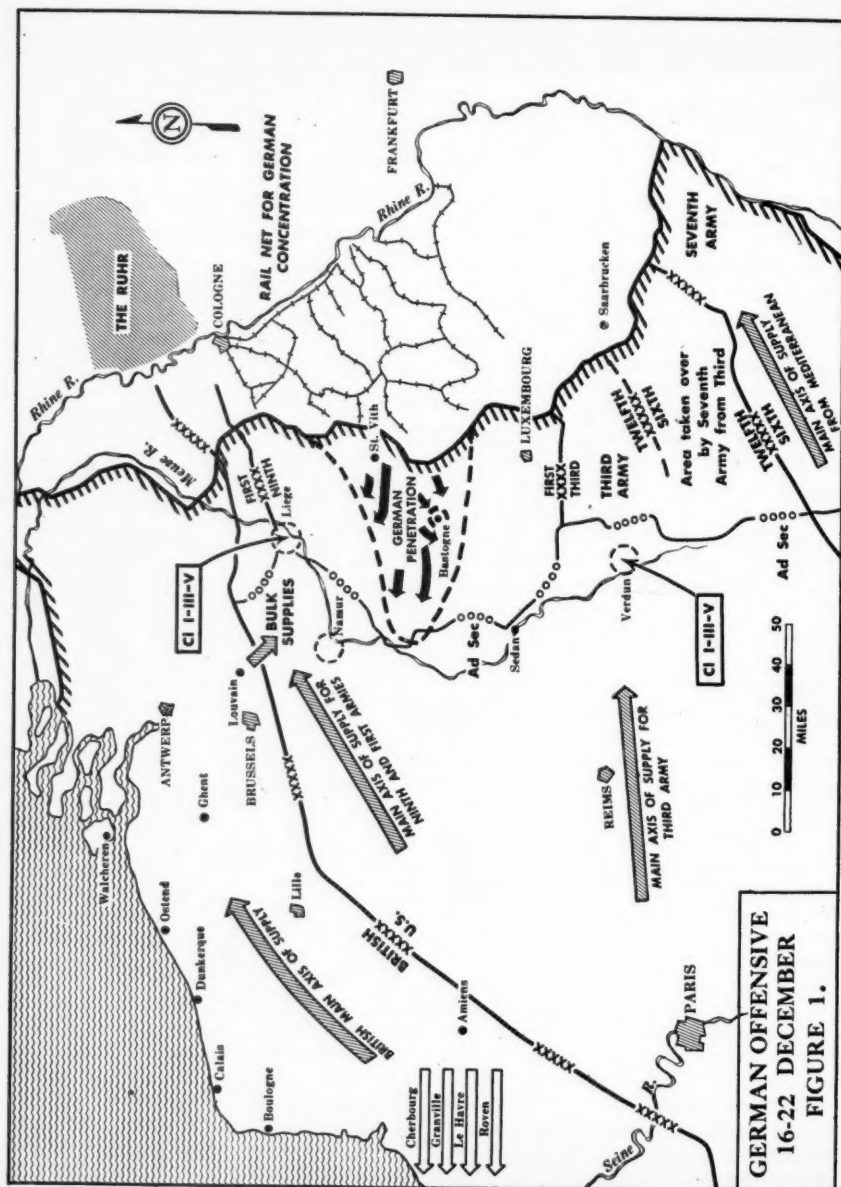
Well prior to the opening of Antwerp, detailed plans and negotiations had been entered into for opening the port, particularly between Communications Zone and Twenty-First Army Group's administrative staff. The division of port facilities thus agreed to was approved by SHAEF. Port and rail facilities were provided for receiving and shipping U.S. supplies, but no storage accommodations were made available in that area for anything more than transit storage. However, the general U.S. supply, shipping and rail situation was such that maximum use of Antwerp had to be made at once, regardless of convenience. Therefore, supplies were unloaded at Antwerp in great quantity, amounting to about 16,000 tons per day by mid-December, and shipped in bulk by rail to Advance Sections, Communication Zone's area of operations, still in the vicinity of

Liege-Namur. As best it could, AdSec arranged to improvise base depot operations to handle bulk cargo, while continuing to supply the day-to-day needs of the Ninth and First Armies. The situation was cramped and burdensome, but could be handled; and the accumulation of huge quantities of supplies so far forward would certainly facilitate support of the spring offensive further north and east.

#### Initial Phase of Ardennes Battle

The German offensive, starting 16 December, changed the situation completely. The strong German attack against the thinly held Ardennes front achieved almost complete surprise, and the breakthrough was complete. By 22 December, the forces actually were located about as shown in Figure 2, although such definite information was not available in the field to the forces on either side. To meet the initial German thrust, the 82d and 101st Airborne Divisions, the only immediately available U.S. reserves, had been thrown into the critical road centers of St. Vith and Bastogne respectively, with results which proved of critical importance in slowing down the offensive. Third Army initiated, on 22 December, an attack on a two-corps front to relieve Bastogne, with forces made available after twenty-five miles of its sector was taken over by Seventh Army. On the British side, Twenty-First Army Group had, on 19 December, ordered XXX Corps to constitute a reserve at Louvain with the 43d, 51st, 53d and Guards Armored Divisions and three armored brigades. The 29th Armored Brigade had been sent to the Meuse River south of Namur.

On 22 December, wire communication within Twelfth Army Group being severed, the Supreme Commander confirmed his verbal directive of 19 December, placing operational control of U.S. Ninth and First Armies, north of the "bulge," under British control, but leaving channels of administrative control and support un-



changed. No one knew at the time what the exact strength, intentions or capabilities of the attacking German force was, except that it was manifestly much stronger in ground force strength than the U.S. forces to its front and flanks.

The German forces were protected from air attack by bad weather until 22 December, when the Allied Air Forces were able to initiate their counteroffensive on a large scale. For the first six days, however, it was almost entirely a ground force action.

#### **Situation of Advance Section, Communications Zone**

The situation on the ground was extremely serious from the AdSec point of view. Some of its troops had unexpectedly become involved in combat, and such inappropriate units as General Service Regiments and Sawmill Companies were fighting German armored columns. However, AdSec's main concern involved its mission of supporting First and Ninth Armies.

Although few supplies of any consequence, either AdSec or army, had been taken by the Germans, large quantities of army supplies had been moved back to the already congested Meuse valley in the vicinity of Liege and Namur. Of even greater immediate import, the Chief of Staff, First Army, had personally given the Commanding General, AdSec, a formidable list of major losses of combat equipment which needed immediate replacement, including blankets, wire, radio sets, machine guns, mortars, rifles and carbines, antitank guns, tanks, jeeps and trucks. Thousands of other items were needed in smaller quantities. In the face of the greatest demand for supplies and services AdSec had ever faced, and the shortage of space for operations, the continued large-scale movement of unsorted bulk supplies from Antwerp became a much greater burden and, in fact, a threat to continued orderly supply.

AdSec at the same time faced two organizational difficulties, each of which proved less serious than might have been thought.

AdSec, with headquarters at Namur, remained responsible to Communications Zone and Twelfth Army Group for supply of U.S. Third Army south of the Ardennes. The German offensive had cut the direct wire communications between Namur and the Verdun-Luxembourg area. However, AdSec's portion of the supply system south of the Ardennes was already functioning on a fairly decentralized basis and was physically independent of supply installations to the north; and this flexibility of organization, plus good working relationships with G-4, Twelfth Army Group, and Third Army, allowed the truncated southern portion of AdSec to fulfill its supply mission during a very critical period without wire communication with its headquarters, and with no change in control or responsibility.

When Seventh Army took over part of the Third Army sector in order to free divisions of the latter for the drive on Bastogne, they took over Third Army installations intact in the area. However, Seventh Army was being supported by Continental Advance Section (CONAD), whereas the service area concerned was supported by AdSec. Since the two advance sections were under different communications zones at this time, much difficulty could have resulted if serious differences of opinion had developed over the rather complicated detailed arrangements required. However, the whole matter was quickly resolved by conference and mutual agreement, and no appeals to higher authority were required.

Another difficulty lay in the continuation of existing U.S. lines of administrative control and supply responsibility, while operational control of all troops north of the Ardennes shifted to Twenty-First Army Group. Fighting was going on with





some U.S. troops engaged well to the rear and south of Namur. It was for a time thought in SHAEF that a large British force might attack the northern shoulder of the German salient, coordinated with Third Army's drive from the south, leaving considerable numbers of U.S. divisions on each side of the British force. The British Corps in the Brussels area was available for such an operation. This maneuver would have intensified administrative complications in the Namur area by crossing British lines of supply and evacuation through the heart of the U.S. base and support area, but it was considered by SHAEF G-4 that these difficulties could be overcome if necessary. However, as it turned out, only small British forces actually entered the battle prior to 4 January, as they were well to the west, out of the way of First Army and AdSec's operations.

#### Danger of a Further Advance

The most serious potential danger in the north, short of a complete German breakthrough, would have resulted from a German advance to the line of the Meuse, from Liege to Namur and Charleroi. There were no natural obstacles sufficient to preclude such an advance, the terrain being no worse than elsewhere in the Ardennes. If this had been accomplished, and if German artillery fire had interdicted areas as far as Gembloux, practically all army and supporting AdSec depots supporting First and Ninth Armies would have been put out of operation. At this juncture, the British Corps in the Louvain area would almost certainly have been drawn into the battle, squarely across the lines of supply to First and Ninth Armies. Supplies from Antwerp, arriving unsorted and in bulk, would have been immediately usable only in the case of bulk items such as rations. In an emergency, the British could have furnished rations and POL (petrol, oil, lubricants), but Class II and IV items would have been

almost unobtainable and ammunition also difficult to supply as needed, except by drawing on the Reims and Paris areas. In the event Gembloux was blocked, no rail communication would have been available north of Charleroi without passing through the already congested British zone. No doubt means of improvisation would have ameliorated some of these difficulties; but it is quite clear that such a German advance, only about twenty miles further, would have seriously disrupted all U.S. supply operations north of the Ardennes and jeopardized supply and support of U.S. First and Ninth Armies to an extent which, if continued, would have seriously affected their combat effectiveness.

The key to the above situation was shortage of accommodations and storage space in the Brussels-Antwerp-Ghent area. Communications Zone, prior to the Ardennes offensive, had requested space and facilities in this area to create base depots, so that supplies shipped to AdSec would correspond to needs, instead of being shipped in bulk as unloaded. The British had been unwilling to sacrifice facilities in this area, which were so vital to their own operations, based upon what they considered an administrative convenience to the Americans, and the matter was not pressed. However, the German advance brought the deficiency into its true perspective. On Christmas Day, based upon oral representation by SHAEF of the grave operational dangers inherent in this administrative situation, the M.G.A. (Chief Administrative Officer) of Twenty-First Army Group agreed to furnish suitable space for such base depots.

The depots were, of course, not actually in operation until the operational danger was past, though they were essential in any event to an efficient supply system and would have been needed regardless of operational implications. The incident illustrates, however, the care which must be taken to coordinate measures for logis-

tical support with tactical operations, and some of the special difficulties inherent in operations of allied forces. It should be especially noted that no formal order was issued in the matter, as it would have been if forces of only one nationality had been concerned.

### Third Army Regrouping

In compliance with orders given by the Supreme Commander on 19 December, Third Army withdrew the necessary forces from action, shifted its front to the north and its main axis 90 degrees counter-clockwise, and attacked with two corps abreast on 22 December. This attack, which accomplished the relief of Bastogne on 26 December, was the key ground operation of the entire Ardennes battle, since our possession of Bastogne was a thumb on the logistical throat of the German forces. Its importance in the eyes of the Germans may be gauged from the fact that they later employed ten divisions trying to reduce the Bastogne salient.

To the writer, the most remarkable feature of Third Army's drive was the speed with which it was launched. Admittedly, it was probably guessed a day or so earlier that an attack on the south shoulder would be required. Even so, to turn over twenty-five miles of front, withdraw two corps, and make all administrative preparations for a hard-driving two-corps offensive to jump off on a new axis three days after the basic order, is a real accomplishment. This maneuver, which attracted little attention compared to some of Third Army's more spectacular achievements, must go down as one of the finest professional performances of the entire war.

Part of this speed, it was subsequently learned, was due to some irregular advance planning by the Third Army staff which had some time previously accumulated extra supplies, located so as to be handy *just in case* it became necessary to attack to the north. At this time Third

Army rear depots and supporting depots of AdSec were fairly well located for the new axis of advance and extra truck transport was made available to establish advance supply for the attack. Other main factors in the quick move included the great personal leadership and drive exercised by the Commanding General, Third Army, and a great deal of ability in his unorthodox but very capable staff, which had learned to meet the exacting requirements of its commander.

### The German Situation

On the side of the Germans, the offensive through the Ardennes was slowed down by initial resistance, and held hard on the flanks, but it had gained a clear breakthrough to the front (see Figure 2). The Germans had attacked with a force of twenty-four divisions, including ten panzer and panzer grenadier divisions on a front, the greater part of which was held by four U.S. divisions. Initially, except for the two U.S. airborne divisions, practically no reserves of ground forces at any location south of Brussels were available to stop this spearhead. In fact, the airborne divisions had only remained on the continent after their last operation as the result of strong arguments by First Allied Airborne Army and pressure by SHAEF on Communications Zone to make facilities available. The German armor had an overwhelming breakthrough, and, although the gap was narrow, it was wider than the German Sedan breakthrough of 1940, or the U.S. St. Lô breakthrough of the previous summer. However, the situation was by no means as serious as this bare recital of facts (and the newspaper headlines of the time) would seem to indicate. The Ardennes Forest, although it can so easily be overestimated as a barrier to military forces, has decided limitations for large scale winter movements. Moreover, the initial moves against the shoulders of the penetration were admirable from a logistical point of view.

Bastogne denied the enemy one good east-west route; St. Vith, as long as it was held, denied him another. The only other route was the poorer road through Houffalize. Third Army's twelve divisions in the Normandy breakthrough had been supplied for a time over only two roads, but not with winter driving conditions, critical gasoline shortages, and a superior hostile air force. Without Bastogne, the remaining road net severely hampered a major German drive to the west of that point. The Germans drove hard towards the shoulders, and especially toward the Liege-Namur area, but found themselves held on the flanks, both north and south.

#### The Air Force Counteroffensive

On 22 December the weather cleared, and the Allied Air Forces initiated an offensive of tremendous effectiveness. Attacks were aimed at the logistical support of the German forces rather than those forces themselves. Heavy and medium bombers hit the German railroads and railheads back of the bulge, including targets east of the Rhine. Fighter bombers attacked road movements, bridges and dumps. On 24 December, German fighter air fields were the target, and over 5,000 sorties were flown. Thereafter, further attacks continued against the German communications with reduced fighter resistance. The German railheads were forced farther back, and supplies for the bulge could only be brought forward by long truck convoys, themselves vulnerable to bombing and expensive in precious gasoline. The Commanding General, USAAF, aptly summed up results of the second phase: "Our air attacks had made Runstedt's supply problem a nightmare."

On 1 January, the *Luftwaffe*, stung to the quick by their impotence to halt the air offensive, retaliated by 800 sorties against allied airfields, but in insufficient strength to achieve really telling results. The effort was too costly to be repeated. Moreover, it was too late.

By 26 December the line of the Meuse had been strengthened on the ground by additional reserves. Encircled troops at Bastogne, supplied by air with 850 tons of supplies despite bad weather, were also relieved on 26 December. By that date, the German prospects of any substantial victory had become nil, though they did not realize it at the time, and much fighting remained to be done. A major part in this favorable development after 22 December must be accredited as a result of the intensive and well conceived air offensive. The German ground forces still greatly outnumbered the troops confronting the head of the salient, but the concentration and supply of any large force for the continuation of the offensive further west was now impossible.

#### Possible German Alternative

The question may well be asked why the Germans did not use more aggressively the golden opportunity of the six days before clear weather exposed them to our air forces. In May 1940, a similar force had advanced 150 miles from Sedan in three days. In the Ardennes breakthrough, the Germans probably could not have gotten to Antwerp, in view of the available reserves uncommitted on the north flank. On paper, it seems plausible that they could have gotten entirely around U.S. Third Army and attacked it from the rear. They certainly could have gone much farther than they did to the west and southwest, so far as opposing ground forces were concerned. The inability of the German mind to improvise in rapidly changing situations, ignorance of our strength and dispositions, respect for Third Army's capacity for armored combat in the open, and fear of our air forces when the weather finally cleared, might have helped prevent their attempting such an envelopment. However, the main reason was probably that their limited logistical capabilities entirely precluded such an operation. German preparations for the

offensive were made in a limited time, with the necessity of maintaining concealment from hostile air observation. Large forward dumps would have given the secret away. Moreover, Hitler had been making the most strenuous effort to rebuild his tactical echelons, and it is hardly to be supposed that his administrative troops and vehicles were equally well provided for at this time. Finally, Germany was suffering from a critical gasoline shortage as a result of our strategic bombing of oil production facilities. The Germans hoped to capture supplies, especially POL, but they over-ran only accumulations of heavy bridging, which had been brought forward by zealous engineers in hopes of a Rhine crossing. German advance columns quickly outran their initial supplies of gasoline and were unable to penetrate to the Liege-Namur area where supplies might have been seized. While the bad weather lasted, Third Army's open western flank looked terribly dangerous on the map, but the Germans lacked the logistical resources to go around it.

#### Logistical Support after the Ardennes

The Ardennes offensive occurred at a period of 1944 when logistical considerations were already beginning to be of much less importance to strategy in the European Campaign than they had been during the fall. The great stream of supply through Antwerp, fairly close to Ninth and First Armies, soon thereafter relieved most supply deficiencies in army areas, except for continued rationing of ammunition. The armies took full advantage of the situation to build up stocks against all likely contingencies, but particularly with an eye to the spring campaign and the crossing of the Rhine.

For this reason, the decision to make the main offensive north of the Rhur and

give it priority in administrative resources turned out to be of much less moment than it would have been under conditions prevailing earlier. The supply situation was such that the priority to the Northern Group of Armies did not preclude adequate supply and support elsewhere. An administrative planning directive was issued by SHAEF to Communications Zone early in February 1945, calling for preparations to support a drive by fifty divisions in the southern sector in the spring; but even this was done largely as a matter of form. When the strategical initiative again passed to our hands towards the close of the Ardennes battle, there remained few logistical limitations. Ammunition was rationed, but over a period of time, savings were practicable. Not only was each desired major operation logistically feasible—they all soon became feasible simultaneously, and adequate preparations were largely automatic so far as SHAEF was concerned.

#### Conclusion

While no attempt has been made to outline the full strategic picture of the Ardennes battle, enough has been given to show the main logistical aspects and the relationship of logistics to other aspects of a complicated and rapidly moving situation. Tactics, logistics, intelligence and air were at this time four sides of the general picture, rather than four unrelated fields, as they tend to become in a static situation. The familiarity of major commanders and key general staff officers with aspects other than their own were of critical importance in assuring our prompt and energetic action. On the other hand, the German inability or failure to provide proper logistical support for their striking force probably was the critical factor which precluded exploitation of initial success.

# Scientific Intelligence *in* Modern Warfare

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IN the 1945 biennial report to the Secretary of War, General Marshall said, "This discovery of American Scientists can be man's greatest benefit. And it can destroy him. It is against the latter possibility that this nation must prepare or perish. The atomic bomb is not alone among the scientific advances that make the possibilities of the future so terrifying. The development of aircraft, rockets, and electronics has become equally incredible."

Since the ability to make war is shaped in a large measure by the matériel and weapons available to a nation and the application of scientific principles thereto, it is evident that scientific intelligence is one of the major yardsticks in the determination of a nation's war potential.

What is scientific intelligence? One's initial concept is usually that of a long-haired individual in thick lens glasses probing around with strange implements over some super-mysterious enemy death ray or indescribable germ. That concept has brought many countries in the past to disaster and this country to the very brink. On the contrary, scientific intelligence is not mysterious, but from simple analysis can be defined logically. *Science* is the systematic study of nature. *Intelligence* is the product resulting from the systematic collection and processing of information. *Strategic Intelligence*, in turn, deals primarily with a nation's war potential; hence, in part, with the application of science, offensively and defensively, to

weapons and matériel as well as sources of power. Thus we can define *Scientific Intelligence* as that factor of strategic intelligence which is the result of systematic collecting and processing of information relating to scientific progress as it affects a nation's war potential. Or, in concise terminology, scientific intelligence is the study of the scientific capabilities of all foreign nations.

The principal uses of scientific intelligence are:—first, to provide a basis for timely development of adequate defensive countermeasures in weapons and matériel; second, to provide a basis for the development of defensive tactics and strategy to minimize the effectiveness of the enemy's weapons; and third, as a basis to effect the improvement of our own weapons and equipment by incorporation of new ideas so as to reach at least an offensive parity with the enemy.

## Historical Background

From earliest recorded history, when man used flake-sharpened flint to improve the offensive effect of his spearheads, to the present atomic age, science has been an integral part of warfare. Transportation, communication, development of weapons, weather forecasts, development of explosives, production of food, medicine, production of synthetic substitute materials, industry, chemicals, camouflage, and even troop morale—all have as their very backbone scientific research and development.

Prior to World War II, organized scientific intelligence did not exist, except in Germany. Consequently, nations had to withstand in war the latest developments of their enemies, either until countermeasures could be developed or until their own achievement in any field could equal that of the enemy, thereby discouraging subsequent use of the most horrible developments due to fear of effective reprisal. On 23 April 1915, at Ypres, the French and Canadians were subjected to clouds of greenish gas and suffered a large number of casualties as well as a major blow to their morale. This initial employment by the Germans of chlorine gas in warfare caught the Allies totally unprepared, despite the fact that chlorine gas had been discovered by Scheele in 1778 and all its properties and effects were well-known. On 15 September 1916, at Cambrai, the British, in turn, took the Germans completely by surprise by using the first tanks to smash barbed wire entanglements and penetrate an organized position. At long last, by the end of World War II, efficient types of gas masks had been developed, along with antitank mines, antitank weapons, and tank obstacles, to minimize the effect of these two new weapons.

During World War II, the United States and the United Kingdom handled scientific intelligence on a piecemeal basis with various organizations dealing in it as part of their mission. In this country, the Office of Scientific Research and Development (OSRD), the Office of Strategic Services (OSS) and Technical Intelligence Service (TIS) all contributed to scientific intelligence.

A major contribution to Germany's ability to fight a long war on several fronts was the existence of a separate scientific intelligence branch since 1934 in its military organization. Japan, by contrast, had a deep-seated distrust of scientists and scientific intelligence, to the extent that anything discovered concerning scientific

developments of the Allies by one branch of the service was kept not only from the other branches of the service, but also from her scientists who were actually engaged in scientific projects to further the war effort. Also, most of her scientists were left working in the dark on minor technical details, with little or no knowledge of the relationship of the feature on which they were working to the whole. There existed no concept of integrated advanced research. As a result, Japan found herself utterly helpless to stand up under the total demands of modern scientific warfare. This comparison of the two major axis powers indicates that a nation's war potential cannot be fully exploited without proper employment of scientific intelligence.

#### Elements of Scientific Intelligence

In order to apply Scientific Intelligence in a study of a nation's war potential, it is essential that we understand the elements which form the basis of scientific intelligence. These are:

1. *Number and Quality of Scientists in the Country.*—How many are there in the country and where are they located? University catalogues and membership lists of scientific and technical societies, and amateur radio, rocket, and glider organizations afford fruitful sources of information. Are the scientists old men past their prime who are holding down honorary posts, or are they young, forward-looking men actively engaged in research? Pupils of great scientists, as a rule, carry the load of scientific development.

2. *Fields in Which Scientists Are Most Proficient.*—In which fields are the efforts of scientists being concentrated? In which are they lagging? Trends, rather than present state of research, are more important, since the *potential scientific capability* of a country is the main interest of scientific intelligence.

3. *Government's Relationship to Science.*—Are scientists encouraged by subsidies



and grants from the government or are they left on their own, financially? What is the government's policy with respect to education of young scientists and technicians?

4. *Research Facilities.*—How extensive are facilities for research activity and where are they located? How modern is research and testing equipment in the laboratories?

5. *Military Applications.*—What applications to military uses have already been made? What military applications of scientific findings are possible, considering developmental trends mentioned in paragraph 2?

6. *Development of Natural Resources.*—To what extent has the nation developed its resources of uranium, thorium, magnesium, aluminum, oil, tin, rubber, coal, etc.? What is the status of production of these resources? Which resources are undergoing extensive geological exploration? What research development is being carried out with respect to synthetic substitutes?

7. *Industrial and Technological Development.*—Which of the scientific findings are actually being developed? What are the industrial and technological resources of the nation which can translate scientific progress into actual weapons and material for prosecution of a war?

#### Study of a Nation's Scientific Capabilities and Intentions

In analyzing the probable methods of waging war by any nation, we study all the above elements in three progressive phases:

In Phase I we deal with the determination from the scientific viewpoint of the **POTENTIAL** of a foreign nation in any type of warfare by a study of the *availability* to the nation of:

1. Top flight scientists.
2. Laboratory facilities.
3. Raw materials capable of use in scientific development.

4. Organization for scientific research and development.

5. Nation's general level of technical development.

6. Industrial plants.

In Phase II we deal with the determination of a foreign nation's **INTENTIONS** in any type of warfare by a study of scientific priorities or emphasis on:

1. Concentration of best scientists on a particular field of endeavor such as atomic energy, arctic conditions, high performance aircraft, biology, chemical warfare, etc.

2. Exploitation of certain raw materials essential to production in a particular scientific field.

3. Devotion to a particular field of the laboratory and research facilities of the nation.

4. Percentage of the national budget allocated to a particular field.

5. Negotiations with other nations to obtain raw materials in which the country is now deficient, or increased research in synthetic substitutes.

6. Degree of security surrounding a certain field of development.

In Phase III we are concerned with the determination from the scientific viewpoint of a foreign nation's present **CAPABILITY** to wage a certain type of warfare by a study of the actual *existence* of:

1. Adequate stockpiles of finished products.

2. Specially trained troop units.

3. Industrial plants of a definite type with capacity to maintain production.

4. Adequate reserves of raw material and technicians to maintain production.

The present **CAPABILITY** to employ any mode of warfare can be determined from a study of the existence of 1 and 2 above, but this **CAPABILITY** would be limited in degree and duration without the existence of 3 and 4.

In these three phases we have considered only the scientific intelligence factor, and

it is evident that a nation's potential intentions, or capability cannot be determined from the study of only one intelligence factor, no matter how accurate or thorough the study may be. Only by a detailed analysis of the information concerning all the factors of strategic intelligence—topographical, political, sociological, economic, scientific, transportation and communications, and armed forces—followed by careful evaluation of the whole—can we arrive at an accurate strategic estimate of a nation's war-making capabilities and intentions.

For example, an accurate economic intelligence estimate of Germany's capabilities prior to World War II would have indicated a serious shortage of nitrates, petroleum, copper, molybdenum, iron, tungsten, and rubber, thus giving most of the economists in the world the basis for their positive predictions that Germany could not fight a prolonged major war. However, scientific intelligence would have shown that under Professor Kessner, Germany had been concentrating on synthetic substitute development, or *ersatzstoffe*, using the Haber process for synthetic nitrates, the Bergius process for synthetic petroleum, a process using sulphur and natural gas for synthetic rubber, aluminum alloys in place of copper, and other substitutes, with the result that she did wage a long multi-front war.

#### Scientific Intelligence Operations

Scientific intelligence is closely interrelated with all other factors of intelligence, and the overlapping of the various factors should not, and must not, result in disagreements as to scope of responsibility, but, rather in mutual support, understanding and substantiation. Technical intelligence is concerned primarily with weapons and matériel in use or already developed for use by any nation, and during the war there was occasional disagreement over the distinction between scientific and technical intelligence over such

matters as whether a new enemy rocket was merely a modification of a standard one in use, hence a responsibility of technical intelligence, or an entirely new type of weapon based on a new scientific principle, and hence a responsibility of scientific intelligence. Clear cut compartmentation of the various factors is not at all essential and leads to quibbling and wasteful duplication of effort, hence those same principles of coordination which were so effectively employed in World War II by our technical services should be applied in the future.

Scientific intelligence collection, processing, and dissemination is, in general, identical with that of any other intelligence factor with some added sources and certain emphasis on techniques.

All sources of information are the same as for any other factor of intelligence with the addition of scientific journals, Annals of Academies of Science, and doctoral theses. All of these additional sources may be easily procured in time of peace, for scientists take great pride in publishing and distributing their writings. In evaluation and interpretation, the principles and techniques are the same as for any other factor of intelligence, but trained scientists must be used to apply the principles and techniques to the information sent in, since very few intelligence officers are scientists, and active competent scientists have no time to serve as observers, but must concentrate on their special scientific research fields. Thus scientific intelligence can be accomplished only by cooperation between intelligence agencies and reliable civilian scientists. If scientific intelligence is to be properly exploited, it is essential that its dissemination to all interested branches of the service and to industry be *timely, accurate, and complete*, in order that its findings may be employed by the users to cope effectively with existing problems. Scientific intelligence, collected, evaluated, interpreted and locked away in

high headquarters as "Top Secret," in the Japanese manner, is the same as none at all, in that effective countermeasures against new developments cannot be devised.

As for the relationship of scientific intelligence to theoretical or "pure" science itself, the abstruse academic ideas of scientists do not at once appear to be of any value in the study of warfare, but in recent decades we have seen highly abstract scientific ideas lead swiftly to the development of radar, supersonic aerodynamics, rockets, guided missiles, submarine development, biological developments, medical developments of plasma, penicillin, etc., the atomic bomb, and a legion of others. The gap between "pure" science and technical application has dwindled from hundreds of years to a matter sometimes of months or weeks. Thus scientific intelligence, a newcomer, has become essential to national security because the time between the development of a theoretical idea and its military application

has dwindled from hundreds of years to a matter of months or weeks, and because we are in an age of atomic power—an advance in potential power that is equalled only by man's first discovery of the use of fire for energy.

### Conclusions

In the words of von Clausewitz, "The art of war is nothing but the result of reasonable reflection on all possible situations encountered during a war." From now on, the reasonable reflections on all possible situations will be vitally a function of time. Do we as a nation dare procrastinate? It should be quite obvious that the nation as a whole, and even more so its armed forces, must give serious attention to scientific research and development, not only as conducted by ourselves, but as carried out by all the nations of the world, lest someday in the near future only a handful may be left to reflect, and then with but precious little to reflect upon.

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Regarding the article on "Soil Trafficability" which appeared in the March 1948 issue of the *MILITARY REVIEW*, Brigadier General D. N. Yates, USAF, Chief of the Air Weather Service, points out that "the primary responsibility for the preparation of soil trafficability studies and predictions now rests with the Corps of Engineers. The Air Weather Service cooperates through the furnishing of climatological data and the preparation and issuing of weather forecasts."

# Ordnance Improvisation in the Combat Zone

Lieutenant Colonel James D. Sams, *Ordnance Department*  
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THE mission of the Ordnance Department in the field is defined by FM 9-5 (Tentative) November 1945, as follows: "The mission of ordnance service in the field is to provide, store, and issue ordnance general supplies and ammunition, to inspect and maintain ordnance matériel in the hands of troops and in storage, to administer ordnance field establishments, to destroy or neutralize and remove unexploded bombs, duds, and other ammunition when necessary, and to provide technical information and guidance."

It is for the accomplishment of this mission that ordnance troops of all echelons are trained and equipped. No effort is spared by those responsible for the training and equipping of our ordnance troops in preparing them to render efficient ordnance service to the combat troops. The record of ordnance service in the various theaters during the late war is the only testimonial needed as to the accomplishment of the above stated mission.

The field to which I shall confine my remarks in this article is not included in the mission of ordnance service as stated in the field manual. As good as our ordnance equipment was, and it was the best in the world, there were times when conditions faced by our combat troops were such that our equipment as issued was not capable of overcoming the obstacles confronted.

It is realized that many months of hard

work by many highly capable men went into the research, development, testing and production of our weapons before they reached the troops who used them on the battlefield. It is further realized that it was impossible for the personnel involved in designing and procuring our equipment to foresee all the special conditions under which the equipment would be required to operate. Furthermore, to produce weapons and equipment incorporating special features necessary to meet all the special conditions which might be encountered in battle would be impracticable and inadvisable.

## Meeting Unusual Conditions

Thus to meet unforeseen or unusual conditions for which no special features had been incorporated into standard items of equipment, it was necessary to improvise on the spot. No doubt all the technical services involved in the supply and maintenance of equipment in the combat zone resorted to battlefield improvisation on occasions. However, I shall use only a few specific examples in which ordnance service contributed to the success of tactical missions through the use of field expedients in the European Theater, thus illustrating that "do something" attitude which was characteristic of the American soldier as compared with soldiers of other nations.

The first, and certainly one of the most important, field expedients to be used in Europe was the hedgerow cutter developed

in Normandy to combat the numerous hedgerows in that section of France. The hedgerows, as is well known now, were major obstacles to our tanks and infantry. The Normandy hedgerow is much more than a common hedge as it is generally thought of in this country. It is actually an earthen wall about five feet high, from four and one-half to five feet thick at the base and two to three feet thick at the top. Growing from the top are bushes and trees; the trees frequently being a foot or more in diameter. The hedgerow is the standard fence for the fields of Normandy and these fields are seldom more than 100 by 200 yards. This layout of hedgerows presented an excellent scheme of defense or delaying action which the Germans exploited to the maximum.



Assembling a hedgerow cutter in the welder section of an Ordnance Company in Cerisy Forest, Normandy.—Signal Corps photo.

When our forces landed in Normandy, each tank battalion had four medium tanks equipped with dozer blades for the purpose of clearing obstacles for advancing tanks or infantry. However, the tank dozer was inadequate, if not in ability, certainly in quantity. The first expedient adopted was the placing of large spikes on the fronts of tanks which enabled the tanks to punch large holes in the earth-

en wall into which charges of explosive were placed. The use of charges was effective in opening a gap in the hedgerow but eliminated surprise.

The 747th Tank Battalion operating with the 29th Infantry Division, developed a bumper made from salvaged railroad irons that proved quite effective in reducing the hedgerow without the use of



Placing hedgerow cutter in position for final assembly to a medium tank.—Signal Corps photo.

explosives. The latter device was demonstrated to members of the First Army Staff and proved so successful that it was decided to fabricate such a device to be placed on the tanks of other units prior to the St. Lô breakthrough which was to take place shortly.

The ordnance maintenance companies of the 52d Ordnance Group of First Army Ordnance were given the mission of procuring material and fabricating the hedgerow cutter for the armored units of First Army. The device, as originally designed in the 747th Tank Battalion, was further modified by the ordnance and production was commenced.

For rapid production it was necessary to have a sufficient number of welders, welding equipment and material, and steel

in forms suitable for the manufacture of the "gadget." The first and most difficult requirement to meet was that of obtaining suitable steel. It was not available in stocks of material which had been brought ashore with the landing force and, therefore, had to be procured locally. Every available source was exploited by ordnance scouting parties. Railroad rails not

a major contribution to the success of the operation which resulted in our forces breaking through the German lines and the subsequent race across France. In addition to its contribution to the tactical success of our forces, the hedgerow cutter was directly responsible for preventing the loss of many lives and of many critically needed tanks.

The accompanying photographs show various stages of manufacture and installation of the hedgerow cutter and views of a tank penetrating a hedgerow.

#### Rocket Modification

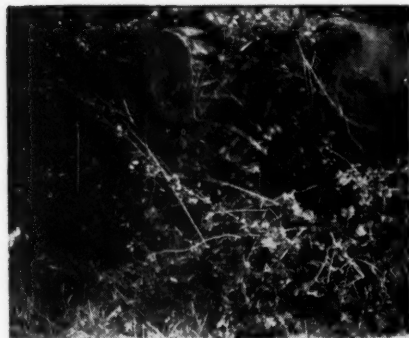
Another field expedient which was adopted by some infantry divisions in hedgerow combat was the modification of the 2.36-inch (bazooka) rocket. The Division Ordnance Company of the 4th In-



Hedgerow cutter after installation on a medium tank.—Signal Corps photo.

suitable for rehabilitation of rail lines were collected, and I-beams, channel irons and the like were collected from destroyed buildings. The most lucrative source of suitable materials was found on the beaches in the form of beach obstacles which had been constructed by the Germans.

The construction of the hedgerow cutter was designated as the number one priority job for welders and welding equipment. Work was continuous day and night, with the night work going on under black-out conditions. And prior to the launching of the assault which resulted in the now famous St. Lô breakthrough, the tanks of the 2d and 3d Armored Divisions and of the separate tank battalions attached to the assault infantry divisions were equipped with the hedgerow cutter. There is no doubt but that the design, development, and manufacture of this device furnished



Tank breaking through a Normandy hedgerow.—Signal Corps photo.

fantry Division, in an attempt to aid the combat troops in their fight against the hedgerows experimented with the "bazooka" in blowing holes into hedgerows. The fuze of the rocket as issued was not sufficiently sensitive to cause the bursting charge to explode upon striking a hedgerow. Ordnance personnel removed the small aluminum disk which is located between the firing pin and the primer of



the fuze. The fuze still did not function on all occasions. It was finally determined that by removing the disc and one and one-half turns of the firing pin spring, the rocket would explode upon striking a hedge. Upon reassembly, modified rockets were painted with white stripes by ordnance personnel, before issue to infantry troops. This marking for identification was necessary for safety reasons due to sensitivity. The rocket, thus modified, was very effective in blowing gaps in the hedgerows.

#### Automatic Carbine

The automatic carbine, developed to meet demands of combat infantrymen for more firepower in hedgerow and house to house fighting, was another ordnance item improvised in the field. The modification



Tank emerging from a hedgerow after having penetrated it on the first attempt.—Signal Corps photo.

consisted of the addition of a change lever to the semi-automatic carbine which, when set on full automatic, held the sear disengaged and permitted the weapon to fire continuously when the trigger was held to the rear. When the standard, fifteen round magazine proved to be inadequate for the increased rate of fire, ordnance troops solved this problem by combining two clips into one, resulting in a magazine of thirty round capacity.

Another example of solving a problem on the spot can be found in the way ordnance maintenance troops, in cooperation with the supported combat unit, were able to put a critical item back into combat. The 155-mm self-propelled gun was an extremely useful piece of equipment in reducing permanent fortifications on the Siegfried Line. One of these weapons was



Dirt and shrubbery collected on hedgerow cutter after penetration of hedgerow.—Signal Corps photo.

evacuated one day in November 1944 to an ordnance tank maintenance company in Maastricht, Holland. The gun had received a direct hit on the side and about six inches from the muzzle. No tubes were available for replacement. That tube had to be repaired or the battalion would be forced to operate with one less gun than was authorized. Inasmuch as these guns were employed largely in direct fire, the maintenance officer suggested that approximately one foot be sawed off the muzzle end of the tube. The using unit and the Corps Ordnance Officer concurred, the damaged portion of the tube was sawed off and the gun was returned to action.

The "Battle of the Bulge" presented unforeseen situations and conditions to ordnance service and ordnance troops as well as to combat units and staffs. After

the Germans had been stopped and the long hard task of regaining ground which had been lost was begun, we had some bad weather in the Ardennes Mountains of Belgium including some twelve to eighteen inches of snow. Packed snow and ice on the heavily traveled roads formed a major obstacle and a hazardous one to the movement of troops and supplies.

### Problems in the Ardennes

Grouzers for the majority of our tanks had long been lost or discarded during the race across France, and replacements were not available. However, an adequate quantity of grouzers would not have been a completely satisfactory answer. Grouzers were effective in providing additional traction for forward or rearward movement, but were not effective in preventing the track-laying vehicle from slipping sideways. The need for a solution to the problem was urgent.

The problem was first solved on those vehicles having steel tracks. Several small steel lugs or pieces of round steel stock about one inch in length were welded on the face of every fourth to sixth track shoe. When it came to the rubber block tracks, however, the lugs could not be welded on the face of the rubber blocks. Finally, the company commander of one of our ordnance tank maintenance companies proposed that pieces of flat stock be welded to the road surface of the track wedge which serves as a separator between adjacent track blocks. This proposal was adopted, tested, and modified to make the lug in the form of a "T" to prevent bending due to side thrust on the track. In this form, Ordnance Maintenance companies of the 52d Ordnance Group started pro-

duction. Metal stock was procured and several thousand pieces were manufactured within a period of two to three days. The solution was all that could be desired, if one had to fight under such conditions.

The above cited examples tend to prove the existence of a hidden asset which the American Army had during the late war to a degree unequalled by any of the other armies, either friendly or enemy. It is the desire of the individual American soldier to solve a difficult problem, to find a means to overcome an obstacle. This desire, coupled with the mechanical ingenuity or gift for "gadgeteering" possessed by so many of our soldiers, was the means of solving so many battlefield problems on the spot.

### Cautions

I feel that a word of caution is necessary. The tendency to "gadgeteer" should not be allowed to run wild. Equipment and materials are always scarce in the combat zone. Each individual cannot be allowed to modify equipment as he sees fit. Materials must not be dissipated. And, regardless of the urgency, introduction of a modification of equipment into battle must be preceded by (1) demonstrated need, (2) adequate design and development, (3) testing and (4) manufacture. Therefore, policy and supervision must be established by higher headquarters. Regular channels should be provided for the submission of ideas.

This will to overcome difficulties contributed materially to localized tactical success and, from an over-all point of view, tended to conserve much needed equipment and materials, saved lives, and hastened the end of the war.

# Personnel Aspects of Mobilization Planning

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## Purpose

**T**HE purpose of this article is to suggest to the reader a few factors which must be considered in the preparation of a Department of the Army mobilization plan, with particular reference to the personnel annex of such a plan.

## General

The most important single aspect of personnel plans for mobilization relates to procurement of personnel. Plans should include a statement of personnel requirements, personnel resources, and the general plan for meeting personnel requirements; as for example, by induction, voluntary enlistments, and the call of reservists to active duty; and the extent of reliance to be placed upon each category during specific periods of the mobilization.

## Training and Personnel Plans Inter-Related

A statement of the mobilization training policy, applicable to individuals and units, is essential to an understanding of the basic personnel plan and the development of details of that plan. Thus, for example, it is necessary to know whether individuals will receive basic and branch training in units or in replacement training centers, and what, in general, are the prescribed training cycles.

Other matters (of primary interest to the Director of Organization and Training) which must be determined before firm personnel plans can be developed are: Plans for training units; utilization of

schools for training technical specialists; plan for supply of cadres, fillers, and replacements; and provisions for continued production by civilian colleges of professional personnel needed by the army and for the utilization, by the army, of the surplus capacity of the college.

The number and types of fully trained and partly trained fillers and replacements available on M-day will determine to a large extent the build-up of the training establishment. When *trained* personnel sources are exhausted, basic training centers and/or replacement training centers should be ready to train incoming personnel without prior service or training. Partly trained personnel may require refresher training in replacement training centers prior to unit assignment. Certainly schools must be augmented to meet requirements for specialists.

Each addition to the training establishment will increase pipeline requirements. It can be readily seen that in mobilization planning, personnel requirements and resources and training plans are inextricably woven together.

## Development of Procurement Plan

*Determining Personnel Requirements.*—The first step in the preparation of a personnel annex to a mobilization plan is the determination of the phased requirements for personnel. This will require consideration of the following factors:

The dates (in terms of M-day) by which National Guard units are to be federalized,

and each class of Organized Reserve Corps units is to be called to active duty.

The number of fillers required to bring Regular Army, National Guard and Organized Reserve Corps units from peace to war strength.

The dates by which fillers for each of these categories must be available.

Filler requirements of bulk overhead by months, for the augmentation of Zone of Interior administrative, personnel, supply, service and training establishments, and estimated total bulk overhead required by M+360 and M+720.

Estimating monthly increases in pipeline strengths and final pipeline strength involves consideration of the number of individuals who will be in personnel processing and training installations at any given time, and the duration of their stay therein, as well as the numbers of individuals in transit at any given time.

Estimating the number of replacements required by months is the most difficult element to determine, and probably the most unreliable, because of the difficulty of accurately foretelling what battle and non-battle casualty rates will be, and what personnel policies will apply from time to time, to influence administrative losses.

*Analyzing Personnel Resources.*—The next step is the determination of the sources from which, and times at which, filler and replacement personnel can be made available to meet phased requirements.

There are four considerations to be made in the analysis of officer personnel resources: First, the number of unassigned officers and enlisted personnel of the Organized Reserve Corps available—generally unassigned reservists—will constitute the most readily available sources of fillers and replacements which can be drawn in immediately upon the passage of emergency legislation; second, the officer requirements to be met in part by the appointment to commissioned rank of quali-

fied warrant officers and enlisted men of all components without special preliminary schooling. An estimate of the magnitude of this source should be a part of the personnel annex to the mobilization plan. Third, a predetermination of the officer specialists not trained by the army, required for war, and available by direct appointment from civil life; and fourth, a determination of the required capacity and timing of Officer Candidate Schools.

If Universal Military Training is adopted, there will be, on any M-day, a large number of trainees undergoing six months camp training. Legislation must be sought before M-day to make possible their immediate transition from trainee to soldier status, without an intervening period of non-military status.

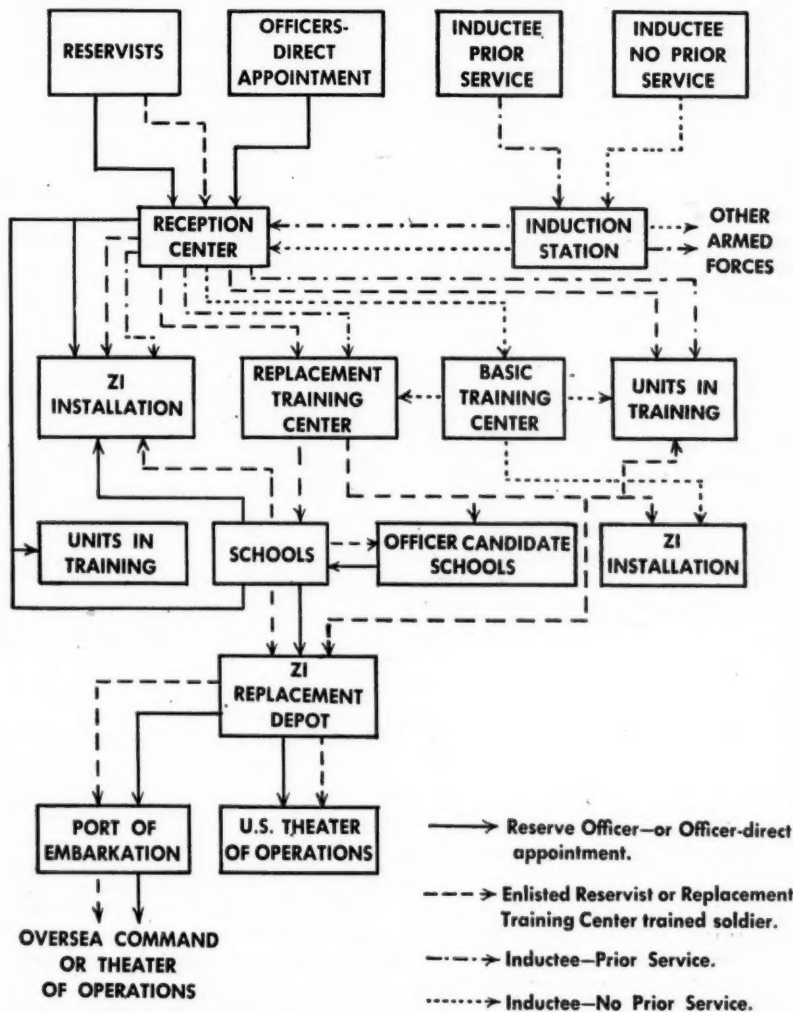
The final resort for fillers and replacements lies in the national manpower pool which can be drawn upon by recruiting or by Selective Service induction, or both.

The status of this pool, as to training, will depend upon the adoption or rejection of Universal Military Training. If Universal Military Training has been operating at full capacity for at least five years on any future M-day, we may expect this pool to include a large number of civilians who have had the equivalent of one year of army training. The younger segments of this pool will prove most valuable in the first year of mobilization, since they will require the least training time and effort to weld them together into effective units.

Depending upon the ability of reservists and other fillers and replacements having military status to meet all requirements until Selective Service can commence delivery of personnel, recruiting should be discontinued on M-day. *In any event it should cease at the time when Selective Service commences bulk deliveries of registrants to Armed Forces Induction Stations.*

Consideration must be given to the maximum monthly rate at which the Selective

## A POSSIBLE SYSTEM OF FLOW OF UNASSIGNED PERSONNEL—FUTURE MOBILIZATION



Service System can deliver acceptable registrants during the mobilization period, and to the proportions of inductees to be allocated to the Army, Navy, and Air Force during the period.

*Balancing Requirements and Resources.*

—Having determined phased requirements and resources it will be necessary to bring them into balance. This involves a consideration of many factors among which the most important include: First, available housing, equipment, supplies, and training facilities by phases; second, the maximum phased capacities of personnel processing and training installations, and of the national transportation system; third, the accurate matching of requirements for unit fillers, overhead, pipeline strengths, and replacements with the above, and with external restrictions upon available manpower.

Timing is more important than numbers, and infinitely more difficult to determine.

*Details of the Personnel Plan*

The evolution of the procurement plan by the methods outlined in the preceding paragraphs will pave the way for the development of the many essential details of the personnel annex to the mobilization plan. Some of these details are suggested below in topic form.

*General Provisions.*—Recommendations to be made by the Secretary of Defense to the President relative to national planning for allocation of manpower resources.

Action to be taken with regard to personnel on active duty. Mobilization plans should contemplate the minimum disruption of existing personnel assignments on and after M-day.

Action with regard to persons on leave.

*Procurement Methods.*—New legislation required to remove existing restrictions on the registration, use, ages, and categories of inductees.

Initial call on Selective Service—for what categories of personnel by age, pre-

vious service, physical qualifications, and race.

The extension of enlistment terms.

Measures to be taken regarding voluntary enlistments and categories of personnel to be accepted.

Measures to be taken relative to securing female personnel for the army.

Call to active duty of unassigned reservists—when and in what numbers.

Special provisions for procurement of officer specialists not included in the existing military establishment.

Utilization of Universal Military Training Corps and its overhead personnel.

*Personnel Processing and Processing Agencies.*—Plan for processing the several categories of personnel:

New inductees.

Inductees with recent prior service.

Volunteers with recent prior service.

Volunteers without prior service.

Enlisted reservists.

Reserve officers.

Number and distribution of induction stations, by army areas and by periods.

Estimated loads, by periods, of induction stations.

Overhead requirements of induction stations and sources of personnel.

Categories of personnel to be processed thereat.

Same as above, for reception centers, if utilized.

Initial disposition of incoming personnel (units, training centers, branch pools).

The chart on page 39 illustrates a possible system of personnel distribution in a future mobilization.

*Miscellaneous.*—Matters relating to discipline, law and order, and military justice.

Provisions for dependents of military personnel.

Changes in personnel reporting and accounting procedures.

Provisions for appointment of general officers.

Revised provisions for promotion.



### Addenda

All plans should be supported by necessary procedural details and statistical information.

To the maximum extent practicable, memoranda, messages, directives and other correspondence and orders which will be required to effectuate the M-day plans should be prepared in final form and appended to the plans, ready for immediate processing.

Those might include:

Public relations releases.

Directive cancelling leaves.

Drafts of legislation desired.

Initial call on Selective Service System.

Forecast of subsequent calls for information of Director of Selective Service System.

Directive to army commanders relative to calling unassigned reservists to active duty.

Information to army commanders relative to recruiting objectives, and instructions as to when recruiting shall cease and Selective Service will become responsible for all procurement of enlisted personnel.

Notification to army commanders of calls to be made on Selective Service and instructions as to action to be taken to

establish and operate processing agencies.

Memorandum to the Adjutant General establishing allocations of incoming personnel to all commands and agencies, and general instructions concerning initial assignments.

Personnel flow chart.

Requests for report from commands subordinate to Headquarters, Department of the Army.

Classification and assignment directives.

Others.

### Summary

The foregoing paragraphs only faintly suggest the magnitude and complexity of mobilization planning at Headquarters, Department of the Army. The plan evolved is based upon many imponderables and is a compromise among many conflicting factors. Training and logistics considerations are inseparably entwined with personnel plans and the final product represents the coordinated efforts of all general and special staff sections, and the major forces and commands.

The current mobilization plan must always be based upon present capabilities, consequently its revision is a continuing full-time job.

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The suddenness with which any future war would doubtless come, means that sufficient manpower must be promptly available. We should have at least three or four million military men in our armed forces who are ready—and sufficiently trained—for service immediately or for service within the first few months. This means a Regular Army and a fully-manned National Guard and Organized Reserve—and in addition a youthful civilian reserve, supplied by Universal Military Training.

*Secretary of the Army Kenneth C. Royall*

# Counterattack Plans—a Technique

Lieutenant Colonel Philip E. Smith, *Infantry*  
Instructor, Command and General Staff College

**A** material factor contributing to our success in combat is the standardized command and staff procedures employed throughout the Army. Because of this, divisions may be shifted from corps to corps, or army to army, as the situation requires without regard to origin or background. An order written in one unit is readily understood by any other unit; all speak the same language in so far as technique, nomenclature and procedure is concerned. The flexibility permitted by this standardization is so taken for granted that very few of us have ever given it a thought, failing to realize that this advantage has not always existed.

## No Uniformity in Counterattack Plans

One of the few things which has not been standardized in form and technique is the counterattack plan. During World War II these plans were issued in many forms. Some were readily understandable only to the originating unit; others failed to include essential details. As a result, in cases where another unit took over a sector, it had to start anew in planning for its counterattacks, the work of the original unit in this regard being lost.

Recognizing the value of uniformity in preparing counterattack plans, the Command and General Staff College has developed a standardized technique for such plans. The purpose of this article is to present that technique to the readers of the MILITARY REVIEW.

## Assumed Situation Is Basis of Plan

A counterattack plan is based on an *assumed* enemy penetration of the defense sector. In small units, on a narrow front, a single counterattack plan may suffice, but usually several plans will be needed; one for each hostile penetration that is considered possible. The assumed penetration is so located as to imply the loss, or threat of loss, of an important locality; one which demands the commitment of the unit's reserve if the integrity of the position is to be preserved. The importance of these assumptions is stressed. We can never hope to determine the exact trace of an enemy penetration beforehand, but if our assumed penetration has been soundly conceived, our plan can be executed with only minor modifications.

## Who Publishes Plan

While it is usual for the superior commander to consult the commander of his reserve for recommendations, the counterattack plan should be published and coordinated by the superior unit and not by its reserve. The latter, of course, will have to publish its own orders for its units. This point is made because some cases have been noted where only the reserve unit produced and published the counterattack plan. This latter procedure is undesirable; it is comparable to a regiment publishing a divisional attack order because it happened to be making the main effort of the division.

### Counterattack Is a Coordinated Attack

The counterattack should be regarded as a coordinated attack against a limited objective (i.e.: to restore the position); it should not be regarded as an isolated effort by a reserve. The reserve makes the main effort but the full resources of all the other subordinate units are employed to assist and support that main effort; the identical doctrine that we employ in offensive action—this is offensive action.

### Details to be Included in Plan

The answer to the question as to what details a counterattack plan should contain is quite apparent; they are those of an attack. They may be generally summarized to include: the general plan of the commander, including objectives; direction of attack; line of departure; zones of action; forward assembly areas; fire support and coordination; missions for subordinate units; tactical groupings; measures for maintaining secrecy in order to achieve surprise; identification; administrative and signal instructions to support the tactical scheme. A good check list for a counterattack plan is contained on page 54, Field Manual 101-5, 19 August 1940 (Check List—Order for an Attack); or in the General Staff Officers' Manual, Command and General Staff College, 1 October 1945, Pages 207-212 inclusive (Order for an Attack—Ground). Initially the counterattack plan is made in as much detail as time permits. Like other defensive arrangements, it is constantly improved and refined.

### Principles to be Observed

A full discussion of the principles to be observed in planning the counterattack is beyond the scope of this article; it would include the bulk of the doctrine on conduct of the defense and in the attack. Both of these are adequately covered in Field Manual 100-5.

Whenever possible a counterattack

should be launched against the flanks of the penetration rather than "on the nose." The terrain will be most important in determining the axis of our attack. If the attack is close to the shoulder we must consider the effect of flanking fire from the enemy.

Enemy action will determine the time of the counterattack. The defender must be ready to launch it by night as well as by day. For example, the enemy may capture a terrain feature and, as a result, have such observation over the sector as to make daylight movement very costly.

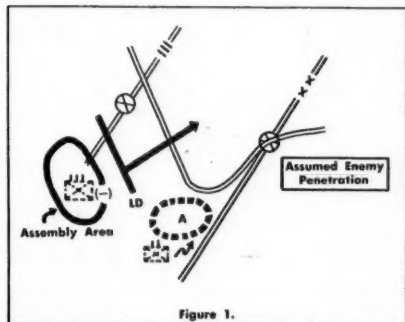


Figure 1.

Under such a condition a night attack is indicated.

It must be recognized that movement of reserves from rear assembly areas to forward assembly areas may take considerable time. Not only must the time-distance be considered, but also the enemy capabilities. This time lag may be a very important consideration.

Traffic control is essential. The plan should include adequate measures to insure that the movements required are not impeded. These measures may vary from giving the reserve priority on certain routes for movement into position to a highly developed and detailed traffic control annex, according to the size of the unit and the available road net.

At night it may be desirable for our own units to wear some means of identi-

fication with high night visibility, such as a white marker, in order to provide for easy recognition and to prevent clashes between friendly forces in the dark.

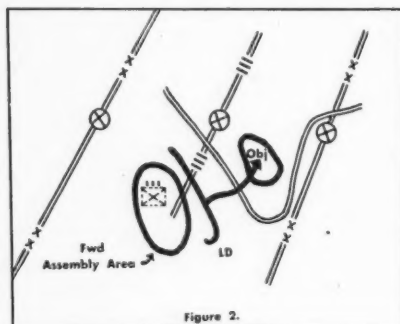
Coordination of fire support is a major problem in a counterattack, because of the circumscribed aspect of the area where the bulk of fire will be required and the overlap in sectors. The fire support plan should provide for coordination, not only of artillery fires, but also of the fire

requires only a telegraphic or radio message to order execution.

### Special Technique Used

There are some questions of technique raised when we superimpose an attack plan upon a defensive situation, especially in the graphical portion of the order (Operations Overlay or Map). A study of the illustrations will indicate a method of handling most of these:

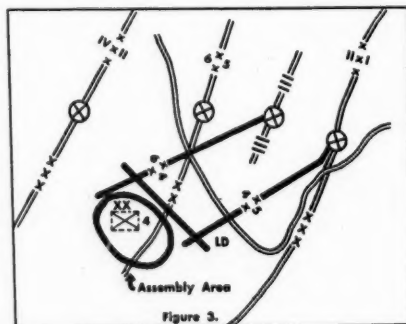
Figure 1 shows the operations overlay of a counterattack plan for a division. The *assumed* hostile penetration is shown as entering the right regimental sector. Some details of the defense are included, viz; the right divisional boundary, the boundary between regiments and the limiting points on the main line of resistance. We see that for the counterattack this plan included a forward assembly area for the reserve regiment (minus), a line of departure, a direction of attack and the trace of a defense locality which one battalion of the reserve regiment is to occupy



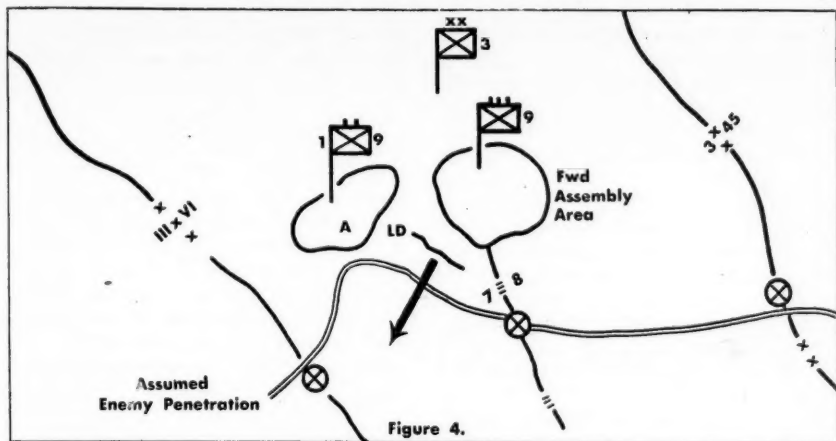
of infantry weapons, other than small arms, including those of adjacent units. One method of accomplishing this is indicated in Par. 3  $\alpha$  of the counterattack plan (following Figure 4). As in any attack the bulk of the artillery should support the main effort.

### Operation (Field) Order Form Used

The diversity in form of counterattack plans up until the present has been noted. At the Command and General Staff College the five paragraph order form is used exclusively. There are definite advantages to using this form, for both the man who makes the plan and the ones who read and execute it. Every one in the Army is familiar with it; it minimizes the omission of essential details; it promotes quick understanding. When ordered executed it becomes Operation (Field) Order Number\_\_\_\_, without unnecessary delay. It will already be in the hands of the units and



in a blocking role. Note that in this case no boundaries are indicated for the attack of the counterattacking regiment. At this level a line of departure and direction of attack will usually suffice. Note also the absence of the familiar "goose-egg" for an objective. The reserve regiment is given the mission in the written part of the plan to "restore the position." Therefore, the



## CLASSIFICATION \*

## CATk Plan How

Maps: Pennsylvania, 1:50,000, New Holland Sheet

1. a. Assumed enemy penetration sector 7th Inf.
- b. 104th FA Gp will Reinf fires of 3d Inf Div with two medium Bns.
2. Div CATks 11-hour K-day to restore position.
3. a. 9th Inf (less 1st Bn, Reinf)

Atchd: 3d Tk Bn (Hv)

Btry C, 3d AAA AW Bn SP

Co C, 3d Engr C Bn (—)

Atk on Div O. Restore position; Thereafter assume defense of right (W) Regtl sector.

- b. 7th Inf: Continue defense in sector; Spt Atk 9th Inf by fire; on Div O assemble Springville (03-69). Div Res.
- c. 8th Inf: Continue defense in sector.
- d. 1st Bn, 9th Inf:

Atchd: 3d Ren Co

1st Plat Hv Mort Co, 9th Inf

1st Plat Hv Tk Co, 9th Inf

1st Plat, Co C, 3d Engr C Bn

On Div O occupy and defend position A; Protect Div right flank.

e. Div Arty:

9th FA Bn: D/S 7th Inf; prepared to Reinf fires 11th FA Bn.

10th FA Bn: D/S 8th Inf

11th FA Bn: D/S 9th Inf

12th FA Bn: G/S; Reinf fires 11th FA Bn.

3d AAA AW Bn SP: Btry C, Atchd 9th Inf; Bn (—) continue area defense.

Annex 1: Arty.

f. 3d Tk Bn (Hv); Atchd 9th Inf.

g. 3d Ren Co: Atchd 1st Bn, 9th Inf.

h. 3d Engr C Bn: 1st Plat Co C Atchd 1st Bn 9th Inf; Co C (—) Atchd 9th Inf Bn (—) prepared to assemble Stevens on 2 Hrs notice for combat employment.

i. (1) This plan effective on Div O. Becomes Opn O No -----

(2) All service units, less Med Bn, prepared to assemble Stevens on 4 Hrs notice for combat employment.

(3) Supporting fires in Z CATk controlled by CO 9th Inf. "No-fire" lines will be transmitted through Div Arty channels for all Wpns except SA. Positively identified targets may be attacked by direct fire regardless of "no-fire" lines.

(4) Priority on roads S Cocalico Creek and W Ephrata to 9th Inf for Mvmt into position.

(5) 9th Inf wear white markers on back if night Atk.

4. Current Adm O.

5. a. Current SOI Index.

b. Div Adv Msg Cen RJ (05.6-67.5) opens H-2 Hrs.

Annex: 1—Arty (omitted)

Distr: A

1st Bn 9th Inf

OFFICIAL

/s/ Smith

SMITH

G-3

JONES  
CG

\* This plan would be classified SECRET.

objective is the area between the limiting points.

Figure 2 shows another operations overlay from a division plan. Here we see the entire reserve employed in the attack role, none in the blocking role. Note here that an objective has been indicated graphically. In this case there was a critical terrain feature which the division commander deemed necessary to capture initially; he, therefore, designated it as an objective, thus directing the subordinate units' effort to its capture. In the written portion of this plan the reserve was also directed to "restore the position."

A corps operations overlay for a counterattack plan is shown in Figure 3. Note the employment of boundaries for the attacking division. With units of this size it is usually desirable to use boundaries for the attack because of the introduction of another division and additional artillery.

A complete counterattack plan is presented in Figure 4. Note the provisions in Par 3 *x* (3) for the control of fires, and the plan for assembling the engineers and service elements for combat employment in Par 3 *h* and *x* (2). It must be recognized that when service elements are assembled for combat employment their original functions cease; it is a command decision as to when such personnel will be more valuable in a combat role than in their service role. However, all personnel and units, regardless of branch or primary duty are available to the com-

mander, and as the battle approaches a climax may be employed in a combat role.

### Rehearsal

Counterattack plans are rehearsed whenever possible in order to familiarize all concerned with their individual duties, the scheme of maneuver and the terrain. If the complete unit cannot be rehearsed, it will often be possible to have at least some of the officers and noncommissioned officers go over the plan *on the ground*. This is essential, not only to the unit which is going to execute the plan, but also to the units through which the counterattack must pass.

### Conclusions

From what has been said above, the following conclusions are arrived at:

1. Standardization in form and technique for counterattack plans is desirable.
2. Plans are made in advance based on assumed enemy penetrations.
3. Each unit publishes plans for employment of its reserve in the counterattack.
4. The details to be included in a counterattack plan are, in general, those of a coordinated attack.
5. The use of the five paragraph operation (field) order is indicated.
6. In an operation overlay for a counterattack plan only slight modification in technique is required.
7. Counterattack plans should be rehearsed.

We must be certain that the facilities absolutely essential to victory are assured continued operation. Dispersion, duplication and armed protection are some of the means that will have to be applied.

*General of the Army Dwight D. Eisenhower*



# Military Psychology—Adjustment

Chaplain (Major) Alfred C. Longley  
Instructor, Command and General Staff College

*This is the sixth and final article of a series on military psychology by Major Sylvester and Chaplain (Maj.) Longley.—The Editor.*

**P**ERSONALITY disorders, as we shall soon see, constituted a grave manpower problem in World War II. The discussion which follows is aimed at showing the commander or staff officer how he can contribute to the lessening of this loss in future operations by applying sound technique of troop adjustment.

Since this subject invades a rather technical field, it is well to familiarize the reader with the terminology which is used throughout this article as well as in other discussions of this problem. These terms are not listed in order to equip the student to diagnose maladjustments, but rather to assist him in understanding the material in the succeeding paragraphs. The terms themselves are listed in such a way that the student can recognize the progressive seriousness of maladjustments, psychoneuroses, psychoses, and psychopaths: the four *stages* under which all personality disorders are classified.

a. *Maladjustment*.—Any mild disturbance of the personality in which there is difficulty in securing a satisfactory adjustment to the environment.

b. *Psychoneurosis*.—This term should not be thought of as designating a particular disease, but as indicating a certain range of severity in maladjustment. A

psychoneurosis is more serious and more incapacitating than is a mere maladjustment, but is milder in degree than is a psychosis (insanity). The most conventional grouping of the psychoneuroses divides them into:

(1) *Conversion hysteria*.—This psychoneurosis is usually manifested when an unconscious conflict finds expression in, or converts into, a physical disorder. Such conversions are frequently caused by the emotional shock resulting from an extremely fearful situation such as occurs on the battlefield. They result in the patient's becoming, for example, blind or paralyzed without any physical reason for this condition.

(2) *Anxiety neurosis*.—A condition characterized by dread of becoming helpless and alone in a hostile, unfriendly universe. This anxiety, if acute, often converts into a physical disorder like a conversion hysteria.

c. *Psychosis*.—This term is reserved for grave mental disorders. A psychosis, excluding those of organic origin, is the result of a grave conflict, and exhibits itself in gravely disordered social behavior. Insanity is the common term for this disorder. Present knowledge of psychosis does not warrant attempts at permanent classification.

d. *Psychopath*.—This term does not refer to any degree of maladjustment. Rather, it is applied to an ego-centric, impulsive, asocial individual. The term indicates a basically unsound personality structure.

The psychopath is usually an intelligent person, endowed with charming manners. He is by no means insane; but he utterly lacks a sense of responsibility, does not respond to love, and has the fixed idea that the rest of the world is wrong, he alone right. The psychopath can well be termed a *moral imbecile*. He is like a fine automobile, complete and perfect in every way except that it lacks brakes. So basic is this fault, that so far medicine has been unable to produce a remedy. Since psychopaths are not insane, they are to be found at large in every walk of life. Extreme cases are dangerous. Not infrequently, the army has had to deal with them too. Experienced commanders can easily recall the number of psychopaths with whom they have had to deal, and the impossibility of doing anything to repair the personality structure of these unfortunates.

On the other hand, the terms used in the *treatment* of personality disorders are:

a. *Psychotherapy*.—This term refers to the treatment of disorders by the use of persuasion, suggestion, educational techniques, occupational therapy, lay or religious counselling, psychoanalysis, and the like.

b. *Psychiatrist*.—A physician with special training in the diagnosis and treatment of mental disorders.

c. *Neuropsychiatric*.—An adjective referring to any personality disorder sufficiently acute to require medical (psychiatric) care.

### Problems of Personality Disorders

The problem of personality disorders in the army is highly important because of its magnitude. By way of recent historical experience consider the following: In 1943 the army suddenly found that nearly as many men were being discharged as were being inducted. Actually at that time more men were getting out of the army for nervous disorders than were

being sent overseas to the Pacific Theater. Due to this situation, the Chief of Staff ordered an investigation by the Inspector General and a popularized version of this report has been published by General Elliot Cooke in his book *All but Me and Thee*.

The figures on personality disorders for the period 1942-1945 may be summarized roughly as follows: Of over 15,000,000 men examined, 1,850,000 or 12 per cent were rejected for personality or mental disorders. This constituted 38 per cent of all rejections for all causes. In round figures, of 12,000,000 men and women in the army, there were 1,000,000 admissions to hospitals for these same disorders, over 6 per cent of total admissions for all reasons. Three to four times as many were seen and treated by psychiatrists without admission to hospitals. 545,000 were separated from the service for mental and personality disorders, or 49 per cent of all medical discharges.

Of all these cases, very few were psychotic or insane. The vast majority, or 80 to 90 per cent suffered from the less severe type of personality disorders: psychoneuroses.

### Induction and Selection

In spite of careful screening, men will be inducted who are not suitable for military service, and probably not a few will be rejected who can be useful soldiers. There is even evidence on hand of many individuals with outstanding military records who had had a prior severe psychoneurosis in civilian life.

Granting that the army has accepted a man because he has passed the basic psychological test given in induction, what problems of adjustment concern him? First of all, the recruit becomes painfully aware that all of his own friends and his family are not just around the corner. He finds this a strange and restricted life and is likely to become quite homesick. Loneliness in the troops can be helped by

occasional passes and furloughs. Later as his sense of group-identification develops, the formation of friendship between comrades and the sense of solidarity within the unit lessens the need for contact with home. But the same loneliness poses a problem of adjustment every time the soldier is transferred to a new group. This is true even of men who have been in the army for many years.

Also, the recruit finds that he has much less freedom of choice than he had in private life. His life is ordered for him—when he shall get up, how fast he shall dress, when he shall eat, where he shall go next and so on through the day until taps, when he must go to bed. Then there is the question of loss of privacy; his life has suddenly become public and paradoxically, the man himself becomes an anonymity. There is no one whose life is more public than a private's. In this respect, adjustment is made easy if the reasons for regimentation are explained to the new soldier—that the mission of the army, that is, its working and training needs, make it impossible for men to live and play as they did in private life; that funds and facilities are not available to provide the same personal conveniences that are enjoyed in civilian homes and communities.

### Training

Psychiatric screening can weed out men who are obviously abnormal at the time of examination. However, something has to be done to take care of the numbers of men who are apt to develop psychoneurotic symptoms during the period of training.

As a result of considerable study, stresses during training are found to center around:

*Poor instructors and training methods:*—Instructors should be carefully prepared for their duties. The training program must always be geared to take into account the fatigue curves of the instructees. Also, men who learn rapidly must not

be trained with those whose progress is slow.

*Homesickness:*—It must be recognized that this is the trainee's first experience in the Army and its attendant adjustments, and is frequently his first trip away from home.

*Defective orientation of the soldier:*—As to his acceptance of the Army; to his job assignment; as to why he is fighting. The Troop Information and Education Division of the Department of the Army was created to overcome these deficiencies, and has proved an invaluable aid.

*The loss of individuality:*—Becoming a number, a small cog in a big wheel, the regimentation, the feeling of being pushed around without rhyme or reason, contrasts tremendously with the freedom of word and deed in civilian life. The establishment of group identification is a support which does much to offset this stress.

In training, a "morale index" is often used as a rough evaluation of the status of a unit, a measure of effectiveness in terms of proper balance between stresses and such supports as are available. Factors to be considered are: The rates for AWOL, venereal disease, sick call, and disciplinary cases of all types. Where any of these rates are excessively high, something is wrong somewhere and corrective measures are needed. The correction obviously involves a manipulation of the training environment aimed at eliminating or minimizing the undesirable stresses just listed, and providing the corresponding supports.

### Combat

The fear of death eventually will cause a breaking of the most stable personality. Statistical curves for neuropsychiatric casualties follow rather closely the Wounded-In-Action curves. As one rate goes up or down, the other does also. The maximum period of time that an infantry

soldier may be exposed to combat before reaching a breaking point has been found to be between 200 and 240 aggregate combat days. An infantry soldier reaches his maximum effectiveness within the first ninety days of combat, and thereafter deteriorates gradually to the point where he is of no further service to the unit. It must be recognized that men wear out just as machines do. Herein is the explanation as to why psychiatric casualty rates in veteran combat troops frequently exceed those in fresh troops.

Normal battle reactions—which can usually be controlled by rest—include moderate to extreme physical fatigue, and extreme and continued battle fear, with marked symptoms resulting from this fear. Such symptoms require no medical attention. Rest will normally dispel the symptoms and restore the patient to combat fitness.

On the other hand, abnormal battle reactions warrant medical treatment. It is necessary to objectively appraise a soldier and not to listen too much to what he has to say, because men frequently feel that they cannot go on before they have really reached the limits of endurance. And for each man unnecessarily removed from battle through medical channels, there is a tendency for many others to attempt escape by means of the same methods.

Valid abnormal battle reactions include: Gross incapacitation and shaking lasting for hours after combat; fainting under stress; extreme noise sensitivity; continued insomnia after combat; conversion hysteria; continued depression and guilt feelings; panic, disorganization of thinking and control, "panic run;" and clouded consciousness.

An analysis of men who had been in combat for long periods of time and were among the last of the original unit, gave certain indications of what supports men in the stress of combat, what enables

them to remain in spite of the impulse to escape in spite of having to see others killed or wounded. These factors are: Absence of neurotic history in civilian adjustment; ability to handle responsibility; qualities of personal leadership, distinct ideals, religious faith; hatred of the enemy; short term goals ("if we take the next hill we can get a rest"); pride in self; and loyalty to the group.

### Replacements

Past experience provides valuable lessons on the close relationship between the replacement system and maladjustments. In instances where replacements are processed quickly and efficiently through the replacement pipeline, they will reach their units with a minimum of maladjustments. Contrariwise, when replacements are delayed in one or more installations for a long period of time, during which they have relatively little to do, a fertile field for personality disorders bears much fruit. Current doctrine and policies on the management of the replacement system are carefully aimed at preventing a repetition of these delays. For one thing, plans will always be made to keep troops profitably busy while they are passing through the system.

Another phase of replacement adjustment involves the integration of these troops in the units to which they are eventually assigned. Sometimes, a man finds himself in the front lines as an individual replacement, often in the middle of the night. Now, it is recognized that as a man trains with other men, he forms friendships, and that a great deal of his strength lies in these attachments. The man who comes to his new unit all alone definitely lacks this motivation, and easily falls prey to a sudden psychoneurosis. It is widely recognized that there is a need of integrating replacements in such a way that they can absorb some of the unit *esprit de corps*, and then join

their regiments, battalions, companies and platoons in a manner that gives them the opportunity to become acquainted with their new comrades. At the same time, this period of integration affords an opportunity to orient the replacement on the situation, and to check thoroughly his training status and assignment. It is now planned to send replacements forward through the pipeline and into units in groups of three to nine. In this way, each soldier has at least one or two old friends to carry him along until he can form new attachments. Such a method does much to alleviate the neuroses which in the past exacted such a heavy toll of replacement troops.

#### **Responsibility for Control of Personality Disorders**

Aside from the obvious fact that the prevention and cure of personality disorders among troops is the responsibility of commanders at all levels, a more detailed approach to this obligation should be presented. As can be gathered from the preceding paragraph, environmental stresses have a great influence on troop adjustment. A wise control of these factors will do much to prevent or at least effect an early cure of most maladjustments. Commanders who understand the impact of environmental stresses and who can skillfully manipulate them and provide supports to counteract their harmful influence will surely bring their psychoneurotic casualty rate to a minimum. This applies to periods of training as well as to life on the battlefield. The information given here will serve to provide commanders with some of the knowledge necessary for the effective control of personality disorders.

Although the problem of personality disorders is usually of immediate concern to divisions and lower units, the commanders and staffs of armies, army groups, and theaters can do much towards its solution. These higher commanders

can more easily provide for the training of troop leaders and surgeons in the prevention and cure of neuropsychiatric casualties. Likewise, higher headquarters can establish effective policies for the rotation of units, and can make more satisfactory provisions for rest and leave than can divisions. Also, in establishing over-all training criteria, army and higher commanders must consider those factors, especially fatigue, which contribute to the neuropsychiatric casualty rate among troops training for combat.

The following staff sections are especially equipped to assist all commanders in discharging their responsibility toward minimizing personality disorders among troops.

*The G-1.*—Since the prevention and effective treatment of personality disorders concern the welfare of the individual soldier and the conservation of manpower, G-1 is directly interested in this problem and its solution. His interest begins with the activation of his unit and continues until it is disbanded. At all times G-1 sees to it that:

All officers and noncommissioned officers are properly instructed in the problems of troop adjustment, and in the technique of the solution of these problems.

Troops are properly assigned to the various tasks and units for which they are best fitted. This he does for a number of reasons, of which personality adjustment is one.

G-3 is assisted in setting up a training program which takes into consideration the necessity of minimizing stresses plus providing all possible supports in the training environment of the troops.

Leaves are granted as liberally as conditions warrant, and full advantage is taken of rest facilities for service as well as combat troops.

Replacement troops are properly integrated into their units, especially in combat.

The psychiatrist is consulted in all matters pertaining to his field.

The chaplain is given ample time and facilities to carry on his program. Religious activities constitute a valuable preventive against personality disorders.

*The psychiatrist.*—Recognizing the need of placing a trained psychiatrist as close to combat troops as possible, medical officers with this qualification are assigned by Tables of Organization to division medical battalions. The presence of an operating psychiatrist at this level achieves three main purposes:

A competent advisor is available to the commander to suggest ways and means of keeping psychoneurotic casualties at a minimum in spite of the varying tactical and physical conditions. He can watch the stresses affecting the troops in training and in combat, and give valuable advice as to how these stresses can be controlled.

A specialist is located on a level where he can do much toward applying the speedy remedies so essential for the complete recovery of psychoneurotic casualties. If the division has a rest camp while in combat, the psychiatrist can use this facility for the quick treatment of his less serious cases.

A professionally equipped specialist is available to supervise the training of all officers and noncommissioned officers in the technique of troop adjustment, and in their responsibility toward preventive measures against personality disorders.

*The chaplain.*—By virtue of his professional training and experience in understanding human nature and its problems, the chaplain is a valuable aid to the commander and medical officers in the prevention and cure of personality disorders. Above all, the religious instruction which he imparts to the troops produces powerful motives which in themselves do much to prevent disorders. Both in training and in combat, the chaplain can do much to control the stresses affecting the ad-

justment of the troops. He can assist in the manipulation of their environment so that the danger of maladjustment is substantially lessened. Also, he is equipped to assist the surgeon and the psychiatrist in carrying out the treatment program for cases of personality disorders. He can be of tremendous help to the mental health of the command for the following reasons:

He represents an authority other than the military and will be sought out for the very reason that his primary concern is with individual "souls."

He will be sympathetic and understanding. The individual coming to him will not feel himself a "mere number." The chaplain treats him as a human being, an individual, a friend. This alone may be decisive in a potential neurosis.

The chaplain can furnish a counterfoil against which the soldier can think out his troubles. Sometimes a man can solve his problem in the course of talking without a word of specific advice.

The chaplain is more objective than the man caught up in the turmoil of his own problem. He may be able on a purely common-sense basis to point out factors which the soldier has been ignoring or overlooking.

### Causes of Personality Disorders

The causes of personality disorders can be expressed by two "P's"; Predisposing and Precipitating. With regard to these causes, it is important to remember that unless they are controlled or removed, an initial maladjustment may soon degenerate into a psychoneurosis, or even a psychosis. In considering personality disorders, one must never lose sight of the importance of time. The quicker the cause is eliminated, or the remedy applied, the better are the chances of recovery from any form of disorder.

*The predisposing causes.*—Instincts, impulses, and faulty mental mechanisms.



When instincts pose problems, they are controlled by what may be called "mental mechanisms." Every living thing develops means and mechanisms to adjust to life situations. Animals develop a protective coloring. Man himself has acquired physical adjustments to his environment. Often his impulses, instincts, or ideals are in conflict with the code or ideals of other people, or they come into conflict with his own conscience. When these mental conflicts occur, the "mental mechanisms" come into play in an effort to resolve the conflict and keep the personality functioning smoothly. We say "in an effort," because often the mechanisms themselves contribute largely to a disordered personality as we shall immediately see. In addition to the mechanisms discussed in our article on *motivation*, the following come into play most frequently. Most of them operate without the subject's being directly aware of their activity.

**Repression.**—Unwanted impulses are thrust down from consciousness and confined in the unconscious realm of the personality, for example, feelings of guilt. This is usually a desirable solution to a personality problem.

**Suppression.**—This again is normally an accepted mechanism. Socially unacceptable ideas are deliberately dismissed and attention is fixed on some acceptable idea.

**Regression.**—This highly undesirable mechanism is operating when the individual reverts to a lower level of development and shows immature or infantile behavior. One of the symptoms of combat exhaustion is realized when battle weary men act and talk like children.

**Conversion.**—This mechanism is evidenced when a conflict-idea in the mind alters a physical process of the body, and produces a functional blindness, loss of hearing, or paralysis. This is "conversion hysteria" which occurs when an intense mental conflict seeks a physical outlet after a mental outlet has been denied. The

mental dynamics convert into physical symptoms.

Excessive strength of one or more instincts, coupled with weakness in the mental mechanisms, or merely an abnormal increase in stresses, foreshadow a man's failure to adapt himself to his surroundings, and his eventual disordered behavior. Unrest in the mind is usually expressed externally in maladjustment, psychoneurosis or psychosis, depending on the intensity and duration of the disorder.

Disordered behavior is not only the fate of those who possess a low frustration tolerance. When he is exposed to an abnormal increase in stress for an excessive period of time, even the average man gives way to maladjustment.

Cultural trends also favor development of personality disorders. The social structure of this country deserves profound reflection and study. Consider for a moment the rising divorce rate (one for every two marriages in urban areas); juvenile delinquency; education aimed at how to earn money rather than how to live; racial, political and religious prejudices. These trends certainly are factors of confused thinking, to say nothing of personality disorders.

Among the common *precipitating* causes of personality disorders are:

Long continued ill health or severe fatigue.

Boredom, too difficult a job, unhappy domestic situations. Even officers will deteriorate under the stress of complex tasks. Many soldiers will go to pieces upon receipt of bad news from home.

The physical changes which usually occur in the forties for both men and women often make personality adjustment difficult.

The fearful situations born of combat will hasten psychoneurosis—even in the normal man. Rabbits sometimes die from fear before they are even touched by the

hounds. The phrase, "paralyzed by fear," can often be more literal than poetic.

Sudden changes in environment pose a serious adjustment problem. Consider the recruit whose lonesomeness is accentuated by his strange new mode of life; the replacement newly arrived on the battlefield, whose adjustment is made difficult by fear and lonesomeness.

### Technique of Preventing Personality Disorders

In view of the analysis of the problem given above, it should be apparent that the prevention of maladjustments lies within the province of the commander more often than that of the medical officer or psychiatrist. The general principle under which commanders discharge this obligation is: Since maladjustments can quickly degenerate into psychoneuroses or psychoses, the immediacy of preventive measures is highly important to manpower conservation.

In dealing with their men, leaders will do well to remember that maladjustments are bound to occur and that manpower losses will result from these disorders. To prevent these losses as far as possible, a commander should always be on the lookout for the easily recognizable danger signs, the symptoms of incipient disorders:

The inability of the man to get along with his fellows as is shown by seclusiveness or an arrogant, argumentative attitude.

Insecurity as shown by a furtive appearance, persecution complex, complaining, lying, frequent drunkenness, insomnia, lack of persistence on the job, unfinished work, frequent physical complaints, and habitual going on sick call.

Anxiety, depression, as shown by a constant worried or sad look.

An increasing lack of personal pride, as shown by untidiness. When a man has previously tried to keep himself neat stops

shaving and having his hair cut, this carelessness is a sure sign that a personality disorder has set in.

Another danger sign is lack of interest as shown by a dull, blank expression, wooden movements, slow talking and moving, and poor attention. All of these are indicators of maladjustments and the officer, when he finds that he has such cases, must take measures to prevent the man or men concerned from breaking down completely.

If the causes of maladjustment are studied carefully, it can be clearly seen that environment is the great factor. Adjustment demands that the individual adapt himself to whatever environment fate creates. If the leader can skillfully manipulate the environment of his men, he has accomplished the first and most important step towards the prevention of personality disorders. This manipulation is not easy, yet far from impossible. It involves proper classification and assignment, balanced work and recreation, a wise use of morale services and a well planned training program. With regard to training, it is important to note that men should not be made to repeat training in fields in which they are already skilled. To make them do so opens the door to serious discontent and maladjustment.

A skillful application of the principles of motivation caps the commander's efforts to prevent personality disorders. Strong incentives to work and fight are powerful counteragents against maladjustments. Incentives also cause a productive release of emotional energy which otherwise could cause the stress and conflict that lead to disorders.

Since fatigue is an effective enemy to adjustment, leaders must constantly do their best to minimize this factor. When leaves and the rotation of individuals and units is impossible, a few hours sleep can

do much towards staving off breakdowns. However, it is still true that prolonged action against the enemy, as well as prolonged inaction, cause even strong men to break. Changes are necessary at reasonable intervals. In this connection it should be pointed out that in May 1945, the Army established a policy to the effect that normally troops would not be kept in the line for a period in excess of 120 days without a period of complete rest. Also, it is well to establish rest camps in division areas to provide rest facilities for men suffering from fatigue, or for those who are showing signs of impending breakdown. The psychiatrist will assist in the supervision of this camp.

#### Cure of Personality Disorders

If preventive measures fail, the commander places the maladjusted or neurotic soldier under the care of the medical officer. Here again, the ordinary surgeon is equipped to handle all but the most severe cases.

In mild cases of neurosis, sleep, induced by drugs if necessary, will usually do the trick. In severe cases the technique of psychotherapy is indicated. Psychotherapy involves the treatment of mental disorders by releasing the forces which cause the disorder. This release is achieved through a free discussion with the patient. This discussion is aimed at leading to an understanding. Psychotherapy can be administered in various ways: through letting the patient "get it off his chest," suggestion, education with orientation, reassurance, persuasion, and even by command. Psychotherapy under partial sleep is a treatment that must be applied by the experienced psychiatrist. In his hands, this technique may prove a very effective method of releasing inhibition, facilitating catharsis, and freeing acute anxiety, particularly in the case of battle casualties.

It has been learned from experience that the most effective initial treatment for psychiatric casualties is immediate seda-

tion provided at the aid, collecting, or clearing station, or at the division rest camp, with immediate subsequent opportunity for clean clothes, shave, and bath. These procedures may occupy from one to three days. During this time the patient should be made to understand, if possible, the great need for his return to battle. This is supplemented by an appeal to his pride, his sense of duty, his loyalty, and a positive statement as to the absence of medical justification for evacuation. With such treatment, approximately 50 per cent of the casualties can be returned to combat duty as against 5 per cent of equally severe cases who are evacuated to the rear.

Mild and moderately severe psychoneurotic patients should not be kept in the hospital beyond the time required for diagnostic study and treatment. After treatment has been accomplished, they should begin their rehabilitation course at once. Both during and after hospitalization, many patients are very greatly helped by the prescription of a schedule of activities. Such patients should not be permitted to spend their time idly on a hospital ward; they should be provided psychotherapy, occupation, recreation, and education, in addition to such physical reconditioning as they are able to carry out. These same activities will occupy all of their time during the rehabilitation course.

If and when a soldier is recommended for discharge for neuropsychiatric reasons, the medical officer has certain special responsibilities. The patient should have a clear understanding of the nature of his illness, what he may expect, and what he can and should do about it. He will be called upon by his family and friends and perhaps even employers to explain the reason for his discharge. It is reasonable to expect that if his intelligence is average, he will want to know the diagnosis. In presenting this, the

medical officer should recognize the undue emphasis the patient may place upon it and the misunderstanding that may arise in the mind of the patient or his family if it is not clear. Part of the patient's problem may lie in the acceptance of the diagnosis and the development of a healthy and intelligent attitude towards it.

#### Misconceptions About Personality Disorders

The work of the psychiatrist, as well as the commander's effectiveness in preventing personality disorders is greatly hampered by a number of misconceptions as to the nature, cause, and cure of these disorders. Following is a list of the prevalent misconceptions together with the correct approach to each:

*Misconception.*—That a neurotic reaction is a conscious and often a feigned state.

*Correction.*—The true neurotic symptom never constitutes a conscious excuse for escaping a problem and therefore is not malingering. In many instances the basic complaint may be capitalized upon somewhat to aid in the achievement of a conscious desire, but this should not confuse the issue. A neurosis is an illness. Neurotic reactions in the army are no different from those seen in civilian life. In all cases, the patients themselves are entirely ignorant of the real basis for their symptoms and as long as they remain so are wholly incapable of controlling them.

*Misconception.*—That neurotic reactions occur only in abnormal people.

*Correction.*—All individuals at times show neurotic symptoms; even severe neuroses should not be regarded as constitutional or inherited illness. A constitutional factor is present in certain types of mental illnesses, but environmental factors are far more potent as the cause of these reactions.

*Misconception.*—That malingering is common.

*Correction.*—Malingering, the intentional simulation of an illness in an individual without physical or psychological defects, is not common, occurring in a very small percentage of all hospital admissions in the army. Moreover, malingering is a psychopathological symptom often only a symptom of an individual's basically unsound personality structure.

*Misconception.*—That an individual having had a neurotic or psychotic illness is permanently incapacitated.

*Correction.*—Many people who have had severe mental illnesses recover entirely and permanently. The recovery rate even for cases sent to our state hospitals runs as high as 40 per cent; and the earlier the cases are recognized and treated, the higher is the recovery rate. In World War II, 50 per cent of all psychiatric casualties in combat returned to combat duty, 25 per cent were assigned to limited duty, and only 25 per cent were discharged. Of the 50 per cent returned to combat duty a little less than 25 per cent were repeaters. This "repeater" rate can be greatly lessened if commanders assign returnees to tasks which cause somewhat less strain than did the soldier's former duties. In many cases the replacement system will retrain returnees for jobs to which they are better suited in view of their medical history. In other cases, the units themselves can arrange for this change in assignment. Beyond this, the former psychoneurotic casualty should be given no preferential treatment.

*Misconception.*—That the neurotic soldier can be forced or threatened into being an effective fighter.

*Correction.*—The neurotic soldier is incapacitated and as ineffective as much as a physically ill soldier. Threat or punishment will invariably make him worse, as well as justifiably embittering him towards the army and his officers.

*Misconception.*—That all soldiers with

psychoneurotic reactions should be discharged.

*Correction.*—Many psychoneuroses are mild in nature and the soldier recovers from the disabling symptoms if treated properly. Often moderately severe neuroses can be alleviated and such men can render useful service in the army. They should not be placed in combat situations. A high percentage of soldiers who develop neuroses in combat can be returned to full duty if treated early and effectively.

### Conclusion

Since this study is aimed at the solution of military problems of personality adjustment, and since the stresses and supports of military situations do much to weaken or strengthen the mental balance of the troops, the following table is submitted. It lists the conditions and practices which promote personality disorders (stresses), along with the factors which stave off these disorders (supports):—

### STRESSES

Environment—	Combat
Climate	Malassignment
Terrain	Vagaries of personnel policy
Isolation	Physical hardship
Regimentation	Fatigue
Loneliness	Domestic Difficulties
Frustration	

### SUPPORTS

Leadership	Identification with unit (Loyalty to buddies)
Motivation—	Normal basic personality
Incentive	Orientation (Information and Education)
Good Morale	Education in mental health
Self-respect	The practice of religion
Zeal for cause	

It should be recalled that personality disorders are progressive, they rapidly grow worse. Therefore if preventive measures fail, curative measures should be applied at once before maladjustments deteriorate into psychoneuroses, before psychoneuroses degenerate into psychoses.

From another angle, it can be said that if commanders at all levels simply strive to keep the *stresses* at a minimum and at the same time to provide all possible *supports*, all types of maladjustments and psychoneurotic casualties will be greatly reduced in all phases of military life. This is the best solution to the whole complex problem, a solution which can be successfully understood and applied by the commander with, of course, the advice and aid of his technical experts: the surgeon, the psychiatrist, and the chaplain. Personality adjustment is an important phase of manpower conservation.

Only through the most diligent collection and the most exhaustive analysis of every scrap of data that might shed light on the war plans of a potential enemy or the extension of his sphere of influence can we hope to make up for the "cushion of time" that has been taken away from us by the deadly speed of air and atomic attack.

*Compton Commission report*

# Repatriation in the China Theater

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## Situation

**A**FTER the surrender of the Japanese in August 1945, there were approximately four million Japanese in the China Theater. Their repatriation is an example of coordination between the United States Army and Navy and the Chinese Government.

At that time the China Theater included, besides China proper, Manchuria, the islands of Taiwan and Hainan and northern Indo-China. Nearly half of the Japanese were located in Manchuria where there was a slight preponderance of civilians over military personnel due to the industrial development of this country by the Japanese. Other than these few facts, little was known as to the location of the Japanese or the transportation facilities of the interior of this region.

In the remainder of the China Theater, there was a slight preponderance of Japanese military personnel over civilians. In October 1945, the Japanese nationals were located as shown on the map, page 60. For repatriation purposes, China was divided into three regions, Central, North and South China. Central China comprised the Yangtse Valley from Shanghai to Hankow; the North and South China Regions were the areas respectively north and south of the Yangtse Valley. In the north, the Japanese were located generally at the ports and along the railroads. Practically all of the rail lines, however, were inoperative due either to the effects of the war or the work of dissident

elements in China. In the southern area, including Taiwan, Hainan and Indo-China, the persons to be repatriated were concentrated at the ports.

The United States considered it extremely important from a political viewpoint that the Japanese nationals be repatriated to Japan with the greatest possible speed. However, the other nations involved were not greatly concerned with this problem. Agreements were reached that a certain number of Japanese technicians would be retained in China to aid in the industrial rehabilitation of that country. It was also agreed that a meeting of all interested parties would be held in Shanghai, on 25 October 1945, under the auspices of Headquarters, United States Forces, China Theater. The head of the Repatriation Section, a sub-section of the G-1 Section, United States Forces, China Theater, was designated chairman of the planning board. A preliminary meeting was held on 23 October at which representatives of G-1, G-2, G-3, G-4, G-5 and the Judge Advocate, Headquarters United States Forces, China Theater, drew up the agenda for the meeting and an outline plan for the repatriation of the Japanese.

The chairman of this board presided at the meeting which convened on 25 October. From Tokyo came representatives from the Headquarters of the Supreme Commander of the Allied Powers and from SCAJAP (SCAJAP was the agency which controlled the Japanese shipping



under General MacArthur's headquarters). There were naval representatives from Seventh Fleet based in Shanghai, its subordinate unit, Seventh Amphibious Force operating in North China, and Third Marine Amphibious Corps operating in North China under operational control of Headquarters, United States Forces, China Theater. The China National Military Council and its American counterpart, Headquarters, United States Forces, China Theater, were represented. Delegates from the Supreme Headquarters, Chinese Ground Forces and its American liaison, Headquarters, Chinese Combat Command, arrived at the meeting from Nanking. Chinese and American members of the War Transportation Board from Chungking completed the representation on the repatriation planning board.

### Problems

The basic problems before the board were: (1) To get the Japanese from the interior of China to the coastal ports; (2) To prepare the repatriates for water shipment to Japan; (3) To transport the Japanese from the China coast to Japan. The execution of these three steps, however, was quite intricate, due mainly to the limited transportation facilities available. The latter were almost non-existent in the interior of China. As shown on the map, there were but three short railroads. These ran between Peiping and Tangku, Nanking and Shanghai, and Canton and Kowloon. They were the only ones that would be of aid for repatriation purposes. It was hoped that other lines in northern China would be available, if and when the political situation was settled in that region.

The highway system into the interior of China, always poor, had been rendered practically useless as a result of the war. It was not even possible to reach Nanking from Shanghai by motor vehicle. The condition of the roads, coupled with the lack of trucks for repatriation purposes,

ruled out any extensive use of motor transport.

The main entry into the interior of China, the Yangtse River, had its limitations. It contained a considerable number of live aerial mines of a type not easily swept. In spite of this fact, there was a limited amount of Chinese shipping on the river. It was estimated, however, that only thirty thousand passages per month could be diverted to repatriation purposes on the Yangtse, an almost negligible figure considering the large concentrations of Japanese in the Yangtse Valley. Hence, it was decided that the great mass of evacuees from the interior would have to march to the coast, reserving the very limited transportation facilities for the sick and wounded and women and children.

The selection of the ports to be used, and their priority for evacuation, involved consideration of operations in progress, weather, economic conditions, mine sweeping operations, the locations of the Japanese nationals and port capacities.

Although the Chinese wished to start evacuation in the southern area due to the food situation, it was agreed to repatriate in general from north to south. A limited amount of repatriation had been accomplished from Ch'ing-tao, Tangku and Chinghuangtao by the Marines and the Seventh Amphibious Force. It would have been uneconomical to shift the shipping already engaged in repatriation purposes, and in addition, there was a great probability of the northern harbors freezing in mid-winter. Finally, it was estimated that the ports south of Shanghai would not be free of mines before the first of the year. This last reason definitely ruled against any disruption of an operation successfully under way.

Thus, it was decided to continue repatriation from Ch'ing-tao, the Tientsin area and Chinghuangtao with the fourteen



(until Fukuoka was mine free), Kago-shima, Fukuoka and Kure when mine free. The total inflow into Japan allotted to the China Theater was 450,000 repatriates per month. At the same time, the repatriation of displaced Chinese and Taiwanese in Japan was considered. The numbers of these two displaced nationalities being comparatively small, no particular problem presented itself. It was agreed to hold up the shipping of the Taiwanese until clearance was given by the Chinese Government. Due to the very recent reoccupation of Taiwan, conditions were still quite unsettled there. It was further stipulated that Chinese repatriates would be shipped to the repatriation ports in China most convenient for further travel to their homes.

Sufficient accommodations were on hand at the selected ports for repatriation purposes, such as warehouses and former Japanese concentration and prisoner of war camps. It was agreed that each port camp have a repatriation capacity at least five times the daily rate of flow assigned that port. This was necessary to insure that the utmost use would be made of all available shipping.

### Processing

The final processing was done at the ports. There a last search for war criminals was made. Baggage was searched for contraband articles which were, in general, arms and explosives, optical instruments, jewelry, works of art, securities, official documents, bars of precious metals and excess amounts of clothing, tobacco and food. A further limitation on the amount of baggage taken was that no more than could be carried on the back at one time was allowed. The amount of money that could be taken along was limited to 500 yen for officers, 200 yen for enlisted men and 1,000 yen for civilians. Finally a medical examination was given to prevent persons with contagious dis-

eases from boarding ship. This examination was handled mainly by Japanese doctors.

For the overseas movement, the Seventh Fleet drew up the sailing instructions for all of the shipping involved. Carrier Task Force 78 was responsible for the operational control of all United States Naval shipping. There was to be a naval commander designated for each port in operation for liaison with the shore elements. It was desired by the Chinese Ground Forces and the United States Army representatives that a schedule be set up for the repatriation shipping. Both SCAJAP and the Navy could not agree to this because of the poor condition of the shipping involved, and the varying priorities put on this shipping. This uncertainty of shipping resulted in an agreement to maintain the stipulated number of Japanese repatriates at the ports in operation to make certain that sufficient passengers would be on hand as needed. Sailing instructions provided that ships would radio in advance giving the designation of the ship, its destination, the estimated time of departure and arrival, and the number and types of passengers on board.

First priority for repatriation was given to the Japanese military personnel. It was further agreed that in so far as practicable, amphibious craft would transport only military personnel and recalcitrant or subversive male civilians. This soon proved impractical. The question of guards on board ship came up for discussion. The guards for SCAJAP shipping were United States Army personnel stationed in Japan. The guard details coming into Shanghai proved to be very happy over the opportunity to visit the "Paris of the Orient." The furnishing of the guards for United States Naval vessels was more difficult to solve. The Navy believed the Army should furnish the guards and vice versa. It was finally agreed that six mili-

tary guards would be provided aboard each naval ship. This guard detail fell to the lot of the Marines.

It was further decided that the Japanese repatriates on naval vessels would take rations for the length of the voyage plus one day, such rations to come from Japanese stores captured in China. It was generally agreed that the first day's ration should be pre-cooked. Facilities for boiling rice for the subsequent days' rations were to be furnished on board the amphibious craft and SCAJAP vessels were to be stocked with sufficient food and fuel in Japan for the round trip.

#### Conclusions

These problems were brought up, discussed and generally agreed upon during the morning of 25 October. In the afternoon of that day, committees of interested parties were formed to work out the details of the plan that were of particular interest to them. The next meeting was called for the next afternoon. At this time the final recommendations were submitted and discussed. Consequently, the completed plan was printed and issued to the various members of the board on 27 October. This plan designated the following responsibilities:

1. The repatriation of the Japanese nationals from the China Theater is a responsibility of the Chinese Government.
2. Japanese personnel will be used to the maximum in accomplishing this plan.
3. Headquarters, United States Forces, China Theater, or its successor, will advise and furnish liaison between the Chinese Government, the Supreme Commander of the Allied Powers and the United States Navy.

4. Supreme Headquarters, Chinese Ground Forces, is responsible for the movement of the Japanese repatriates in China to the ports of embarkation and for their preparation for the overseas movement to Japan.

5. For the water movement between China and Japan, the operation of the amphibious craft is a responsibility of the Seventh United States Fleet; the operation of other shipping is a responsibility of SCAJAP.

6. To carry out the mission assigned above, Headquarters United States Forces, China Theater will establish a repatriation headquarters in Shanghai. In addition, this headquarters will establish port liaison officers at all ports in operation, except those ports operated by United States Marines.

China Theater Headquarters took exception to the responsibility of furnishing the above port liaison officers, due to a War Department directive to deactivate that headquarters with the utmost rapidity. However, such liaison was furnished as a result of a radio to the War Department.

It is of interest to note that, due to prior planning, the plan for the repatriation of the Japanese from the China Theater was evolved in three days. This accomplishment was not appreciated by some of the visiting board members as Shanghai at that time was the best spot in the Orient. It is further noteworthy that although this plan was not signed by any of the headquarters represented on the planning board, it was the basis for the repatriation operations in the China Theater.

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The Nation today needs men who think in terms of service to their country and not in terms of their country's debt to them.

*General Omar N. Bradley*

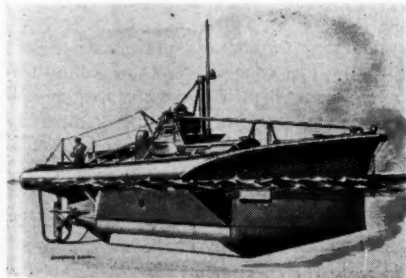
# MILITARY NOTES

## AROUND THE WORLD

### GREAT BRITAIN

#### 37-Foot Submersible Craft

One of the top secrets of World War II was the construction of a considerable number of 37-foot submersible craft. Some of them saw service in the Pacific. The



British 37-foot Submersible Craft.

craft is 37 feet long, with a beam of 7 feet 6 inches, and it carries a crew of four.—*The Sphere*, London.

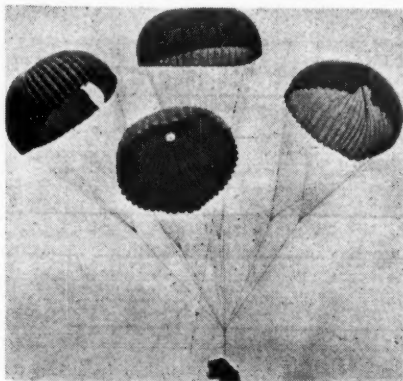
#### Beneficial Gas

A poison gas made in England for war use has been discovered to have a beneficial use in treating intestinal paralysis. The gas is DEP (di-isopropylfluorophosphate). The US Chemical Corps and the University of Pennsylvania have found DEP useful in glaucoma, an eye disease, and myasthenia gravis, a muscle weakening condition.—*Science News Letter*.

#### Airborne Supply

British airborne forces are using parachutes to drop heavy equipment from planes. Four parachutes, each 60 feet in diameter are used.

Since a gun or jeep hits the ground at about 16 miles an hour, it was necessary to devise a special container which provides shock-absorbers under the wheels,



Jeep Dropped in British Operations.

a strong support for the heavier parts, and a device to keep it horizontal.

This method was demonstrated recently in the first large-scale airborne maneuvers held in Britain since World War II.—*The Illustrated London News*.

## ITALY

### Evacuation of Troops

All United States troops in Italy departed on 14 December from Leghorn, ending the occupation which began in July 1943 with the invasion of Sicily. The evacuation had been underway since last October. As the troops departed, President Truman announced that the United States would help the Italians if their freedom or independence was threatened. British troops in Italy departed from Venice on 8 December.—*The New York Times*.

### New Trainer Plane

Among the several new Italian airplanes to be built since the end of the war is the Aeronautica d'Italia S.A. (Fiat Group) G.46, a two-place trainer plane. It is



Fiat G.46.

of all metal construction, powered by a 205 hp Alfa Romeo six-cylinder inverted-V motor. The cruising speed is 150 mph.—*The Aeroplane Spotter*.

### Return of Ships

The British government has decided to join the United States in relinquishing its claim on certain units of the Italian fleet in favor of the Italian government. Both countries have indicated to the Italian government their readiness to go as far as the treaty permits in handing back to Italy such ships as the Italians are allowed to have.—*The New York Times*.

## PORTUGAL

### Defense Reorganization

A law decreed in 1947 reorganizes the national defense of Portugal. The new organization reduces the number of committees and boards which in some instances had overlapping functions.

These are the main provisions of the law: The government is responsible for national defense. It is assisted by a superior council which in time of war becomes a war cabinet. Conduct of operations is in the hands of theater commanders. There are defense councils in the principal colonies.

These dispositions follow customary lines. Attention should be called, however, to the creation of a ministry and a superior council of civil mobilization, agencies which deal with civil mobilization and other aspects of national defense not specially military.

The new Portuguese organization does not follow the general trend toward unification. Portugal still maintains two ministries: a ministry of war and a ministry of the navy.—*Revue de Défense Nationale* (France).

## DENMARK

### United Air Command

Denmark has hitherto had separate army and naval air arms, but steps are being taken toward a unified command. A parliamentary defense commission is working on the problem. The Danish Minister of Defense, however, recently declared that the two arms would have to work under a united command, and the former general inspector of the Army Airborne Forces was given the appointment. While declaring that Denmark must have a united air force, the commander of the Royal Naval Air Service disagreed with the Minister of Defense and resigned.—*The Aeroplane*.

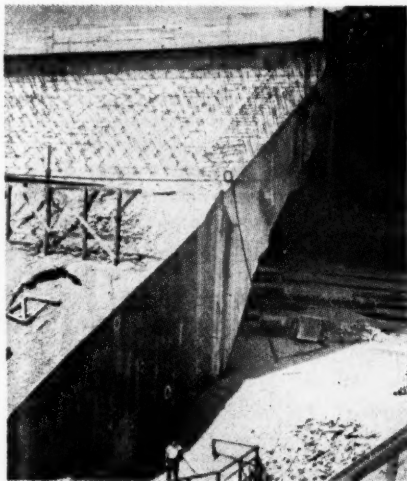


## GERMANY

### Underground Installations

During World War II, German plans for and utilization of underground installations were much more extensive than those of any other country, but not until 1944 were comprehensive plans to move underground undertaken.

In the aircraft and oil industries, the policy of dispersal was changed in 1944 to dispersal and underground protection.



**Bunkerwerke, Underground Factory.**

Other underground programs were undertaken in such industries as rubber, optics, precision instruments, and power plants.

Generally, the Germans adapted existing facilities to underground storage or production. Mines, caves, beer cellars, railroad tunnels, and highway tunnels were remodeled to house manufacturing or storage. New construction was generally of two types: tunnels or galleries excavated into the sides of hills, and buildings placed wholly or partially underground with bomb proof covering. Among the latter

was the *Bunkerwerke*, with a heavy reinforced concrete roof.

Among the conclusions regarding the German experience are the following: Underground sites should be prepared before, not during, a war; it is practical



**Jet Plane Plant in Salt Mine.**

to place almost any type of industry underground; standards and costs are the same as above ground; there are no adverse effects on workers; existing mines, caves, etc., were the main places where



**Grenade Factory in Salt Mine.**

plants got into production; large centralized underground factories are best; and underground plants are not a complete answer to maintaining war production, because communication lines can be disrupted.—*The Military Engineer*.

## FRANCE

### Training Plane

The Morane-Saulnier M.S. 472 is a day and night advanced operational training plane. It mounts two 7.5-mm machine



guns in the wing, and can carry a bomb load of 442 pounds. This two-place, single-motor monoplane has a maximum speed at sea level of 223 mph.—*The Aeroplane*.

## THE NETHERLANDS

### Jet Planes

The Dutch military budget for 1948 provides for the replacement of out-moded Spitfire aircraft by jet-propelled planes. Special schools are being established for training pilots. The Dutch air force is fixed at 7,000 men, 1,800 of whom are to be stationed in the Dutch East Indies. The strength of the Dutch ground forces is raised to 50,000 for the mother country and 60,000 for the Dutch East Indies.—*Allgemeine Schweizerische Militärzeitung*.

## JAPAN

### War Claims

Initial reparations claims filed by eleven Pacific Allies against Japan amount to approximately 54 billion dollars. China claims 40 per cent of the total, and the Philippines 15 per cent.—*Associated Press*.

### Hiroshima Casualties

The latest official estimate of the dead at Hiroshima in the atomic bombing is set at 78,150 compared to the 100,000 previous estimate.—*Associated Press*.

## USSR

### Maneuvers

Large scale maneuvers by the Soviet Army, coordinated with the Russian Pacific squadron and the armed forces of the Peoples Republic of Mongolia, took place in June and July, 1947, from Transbaikalia to the Behring Strait and Kamchatka. In addition to ground forces and powerful air forces, four airborne divisions took part. In European Russia, between Riga and Odessa, six other airborne divisions held large scale maneuvers.—*Bulletin Militaire*.

### Lenin Academy

The Lenin Military-Political Academy trains, in part, assistant regimental commanders in the political field, and functionaries for the formation's political organization. The training period is four years.

The academy accepts officers from the armed forces and members of the communist party not over 32 years (30 years for the Air Force), who have occupied a party position or a commander's post for at least three years. Additional requirements are graduation from a modern or science school and a military or political school, and a certificate of conduct from military or political authorities.

Admission is gained through a recommendation from the military district's political administrative organization. Officers may also be recommended directly by the high command's chief political administrative agency.

The entrance examination covers literature, geography, history of the communist party, and a knowledge of regulations. Officers who possess a higher school education are exempt from the examination.—*Ny Militär Tidskrift*, Sweden.

## INDIA

### Ghurkas in British Service

Volunteer Gurkha troops will continue to serve in the British Army, despite Britain's withdrawal from India, according to an agreement which has been reached between India, the United Kingdom, and the State of Nepal, the home of the Gurkas. Eight battalions of Gurkha troops are allowed under the agreement. It was not announced where the troops would be used.—Reuters.

## IRAQ

### British Withdrawal

British Middle East Land Forces headquarters at Cairo reported in October the completion of the withdrawal of British Army elements from Iraq.

With the withdrawal of troops, the British and Iraqi governments reverted to the terms of the Anglo-Iraqi treaty of alliance of 1930, under which Britain maintains in Iraq only a military mission and Royal Air Force bases at Habbaniya and Shibah. For some months a small British military liquidation staff also will remain to clear up financial details.

Considerable quantities of equipment and vehicles have been made available to Iraq's Army out of the stocks of war material left there during the time the eastern route for sending aid to Russia was maintained.—*The Times*, London.

## TURKEY

### Army Maneuvers

The Turkish Army maneuvers held in November were the first large-scale maneuvers held by the Turks since the outbreak of World War II. The problems of the maneuvers, which were held in Turkish Thrace, involved exercises in defense of the Bosphorus and the Dardanelles against a supposed enemy attack from the north.—*The New York Times*.

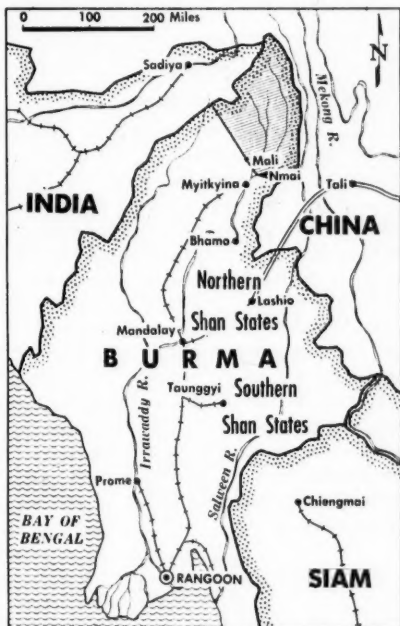
## CHINA

### Search in Lololand

After more than a year of continuous investigation, United States military authorities in China have proved unfounded the reports that some American Army personnel might be held captive by the Lolo tribes of Western China.

The investigation was conducted by a detachment of Graves Registration personnel of the Quartermaster Corps with the US Air Forces Air Division attached to the Army Advisory Group in China.—*Signal Corps*.

### Territorial Claim



A 53 year-old boundary dispute between China and Burma is to be taken up again for settlement, the Chinese Foreign Ministry has announced. The area involves 75,000 square miles at the northern edge of Burma.—*The New York Times*.

## DUTCH GUIANA

### Withdrawal of Troops

United States troops were formally withdrawn in October from Zandery Field, Dutch Guiana, a wartime outpost of the Antilles Department. Both Netherlands and United States troops participated in the ceremony, at the base 30 miles from Paramaribo, which included the presentation of the American flag by Maj. Gen. Edward H. Brooks, Commanding General Antilles Department, to Governor Johannes Brons. The field was built in 1941 for anti-submarine operations, and for troops guarding Surinam's bauxite mines.—*Army and Navy Register*.

## PERU

### Military Developments

In reviewing the activities of the Peruvian armed forces during the year, President Bustamante spoke of the army's new policy of raising much of its own food, thus improving the nutrition of the troops, giving them practical agricultural training for civilian life, and relieving the strain on civilian markets. Another army innovation was the formation of a company of road workers which will cooperate with the Ministry of Development in making the Huánuco-Pucallpa highway an all-weather road. During 1948 the army will supply two battalions of road workers to construct roads in zones where there is a labor shortage.—*Bulletin of the Pan American Union*.

## PANAMA

### Sea-level Waterway

The governor of the Panama Canal Zone has recommended to Congress the construction of a sea-level waterway for the Panama Canal as a means of meeting the threat of bombing attacks, including attack by atomic bomb.—*Associated Press*.

## AUSTRALIA

### Japanese Occupation

Withdrawal of British troops from Japan leaves Australia with 11,000 occupation troops there, and New Zealand with 3,000. Britain originally had 10,000 troops in Japan, but this was reduced to 4,500, and these were finally withdrawn. The last of an Indian contingent of 11,000 also has left Japan.—*Australian News Summary*.

### Air Committee

A British air liaison committee recently arrived in Australia to confer with Australian Air Force officials on bombing tactics.—*Australian News Summary*.

### Clothing Tests

The Australian Antarctic expedition is testing all kinds of cold weather clothing for the Canadian and British armies. The clothing was designed during the Arctic exercises carried out by Canadian and American troops during 1945.—*Australian News Summary*.

### Radar to Moon

Australian scientists have succeeded in contacting the moon with radar signals, a feat previously reported by the US Signal Corps.—*Australian News Summary*.

### Naval Aircraft

Australia has been negotiating with the United Kingdom for the purchase of ninety modern aircraft from the Royal Navy to equip the first aircraft carrier which Australia expects from the British government in 1948. More planes will be purchased when the second carrier is added to the Australian Navy.—*Australian News Summary*.

## UNITED STATES

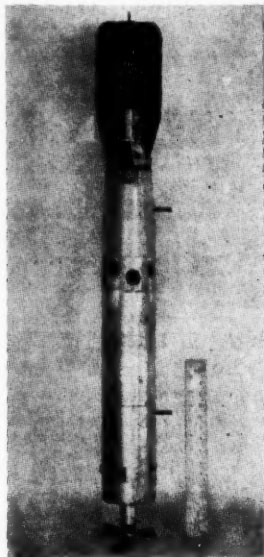
### Incendiary Bomb Development

Because the Chemical Warfare Service was charged with the research and development of incendiary materials, it persisted in the studies it had begun in World War I, and established the series of projects which were to pay off in World War II.

Approximately 26 million incendiary bombs of all types were produced. In the attacks on German cities, between 75 and 80 per cent of the total destruction was due to fire alone. In Japan, fire bombs destroyed 160 square miles of the principal industrial cities. In Europe, only 6 per cent of the total bomb tonnage was made up

ment, storage, and issue of incendiary bombs.

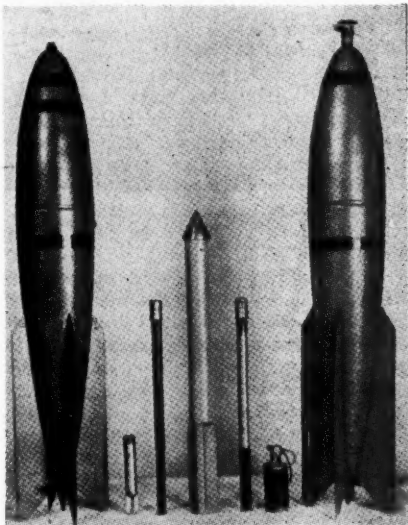
During World War II, the Chemical



Combination Magnesium and Oil Bomb.

of incendiaries, while in Japan it was approximately 20 per cent.

In September, 1941, the Chemical Warfare Service was given the entire responsibility for investigation, design, develop-



Incendiary Bombs Developed after World War I. Left to right, Mark II; Baby Incendiary; Mark I Dart; Mark II Dart; Mark I Dart (modified); Incendiary Grenade (for size comparison); and Mark I Bomb.

Warfare Service developed and produced the following incendiary bombs:

- 4-lb Magnesium Bomb (AN M50A2).
- 4-lb Explosive Magnesium Bomb (AN-50XA3).
- 2-lb Magnesium Bomb (AN-M52A1).
- 4-lb Thermate Bomb (AN-M54).
- 6-lb Solid Oil Bomb (M69).
- 6-lb Explosive Solid Oil Bomb (M69X).
- 6-lb PT Gel (Goop) Bomb (M74).
- 6-lb Explosive PT Gel (Goop) Bomb (M74X).
- 100-lb Solid Oil Bomb (AN-M47A2).
- 500-lb PT Gel (Goop) Bomb (AN-M76).

—*Chemical Corps Journal*.

## Seaplane Berth



The Navy has developed a new self-propelled floating seaplane berth which makes landings from flying boats easy. Aircraft anchor in waters off-shore and the berth is swung alongside by means of pontoons and a 600-foot submerged cable.—*The Military Engineer.*

## Conversion of Motors



Pratt and Whitney Aircraft Division of United Aircraft Corporation is converting and overhauling 72 Wasp Major Engines used in the Douglas C-47 Globemasters. The engines, now rated at 3,000 horsepower and known as the R-4360-27 series, will be re-designated the R-4360-35 on conversion and will develop 3,500 horsepower.—USAF photo.

## Arctic Fire Fighting

Experiments at Fort Belvoir in the use of snow and ice for fighting fires in Arctic temperatures have been successfully conducted by the Engineer Research and Development Laboratories. The tests show that snow and ice expelled from a flexible hose can successfully extinguish fires. An ice-crusher and slinger machine, commonly used commercially in top-icing refrigerator cars and trucks, has been employed in the experiments. It has been demonstrated that



## Fighting Fire with Ice.

ice has a decided extinguishing effect on gasoline, naphtha, and diesel fuel oil fires.—*The Military Engineer.*

## Few Effects on Bikini

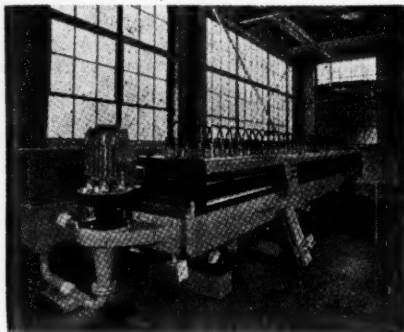
A year after the atomic bomb tests at Bikini, the Navy found few effects of the blasts remaining. Slight amounts of radioactivity were occasionally detected in fish and other aquatic organisms, but there appeared to be no large-scale differences in either the fixed animals on the reefs or in the swimming life in the water. In some of the organisms there was a higher activity of one of the respiratory enzymes, catalase. No land plants or animals showed any trace of their experience with the atomic bomb, no monsters had been born or hatched, and animal reproduction appeared normal.—*Science News Letter.*



### Chemical Equipment

An extensive exhibition of German chemical industrial equipment has been collected at the Army Chemical Center and assembled with the assistance of the Office of Technical Services of the Department of Commerce.

Of major interest to the Chemical Corps and the alkali-chlorine industry are two types of mercury chlorine cells. This type of cell produces a high grade 50 per cent concentration of caustic soda which can be shipped direct from the cell to the



One Type of German Mercury-Chlorine Cells Exhibited at the Army Chemical Center.

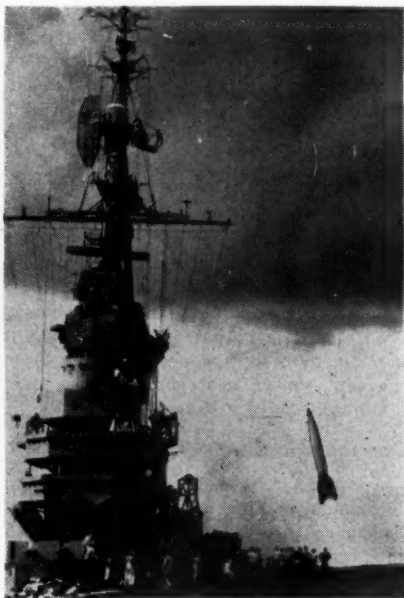
consumer without further processing, whereas the cell now installed in the Chemical Corps arsenal plants requires evaporation from 12 per cent to a commercial 50 per cent concentration.

Since in wartime operation practically all the caustic soda is an excess by-product, this type cell may offer both a saving in labor and fuel—both scarce in wartime. Both Germany and Japan are reported to have used the mercury type cells extensively.—*Chemical Corps Journal*.

### Seaborne V-2 Rocket

On 6 September 1947, for the first time in history, a German V-2 rocket was fired from the flight deck of an aircraft carrier. The launching of the rocket, which took place in the Atlantic Ocean in the vicinity of Bermuda, was accomplished from the flight deck of the 45,000 ton aircraft carrier *USS Midway*.

Immediately after the firing, the *Mid-*



A German V-2 rocket being fired from the flight deck of the *USS Midway*, near Bermuda, on 6 September 1947.—Navy Photo.

*way* conducted normal flight operations. The rocket, however, travelled only about six miles and then exploded.—Department of the Navy.

## Miscellaneous Notes

### Command Changes

Changes in overseas commands recently announced by the Department of the Army include the following: the Panama Canal and Antilles Departments are consolidated and renamed "United States Army, Caribbean," with headquarters at Quarry Heights, Canal Zone; the Alaskan Department becomes "Headquarters, United States Army, Alaska"; the Hawaiian Department is abolished and Army Ground Forces, Pacific, becomes "United States Army, Pacific"; Headquarters, Ground and Service, Europe, becomes "Headquarters, United States Army, Europe."—Department of the Army.

### Periscope Camera

A new type of periscope camera for submarines has been developed by Eastman Kodak Company. The camera can make close-up beachhead pictures faster than one every second, thus being valuable for reconnaissance work and planning for beachhead operations. Another device makes it possible to process a sheet of film from the new camera in daylight in less than a minute.—*Science Digest*.

### German Air Data

Approximately 1,500 tons of German documents, making a complete history of German air research from 1933 to 1945 have been evaluated, classified, catalogued, indexed and published in microfilm by the air intelligence section at Wright Field.—Associated Press.

### Planes Back to Service

The Air Force recently re-commissioned 700 planes for active service. Taken out of storage were 400 P-51 and P-47 fighters, 250 B-29 medium bombers, and fifty A-26 light bombers and reconnaissance planes.—*Armed Force*.

### Airborne Reorganization

Army Ground Forces recently authorized the reorganization of the 82d Airborne Division at full strength under the new tables of organization for airborne and infantry units. This is the first time since the end of World War II that a division has been manned at authorized strength.—Department of the Army.

### Army Comptroller

After many months study by the Army, the Secretary of the Army has established the new Office of the Army Comptroller. The duties of the Army Comptroller include general supervision and control of all budgetary matters, preparation of budget estimates, formulation and coordination of basic fiscal policy, supervision of use of foreign exchange by the Army overseas, development of cost analysis and control, survey of effective utilization of manpower and of administrative organization, methods and procedures, in the interest of efficiency and economy, and coordination of statistical data. The personnel and functions of the Budget Division, the Manpower Board, the Central Statistical Office and the Management Office of the Office of the Chief of Staff, have been assigned to the new office.—Department of the Army.

### Rapid Growth in NG

The National Guard in 1947 experienced the most rapid expansion in its history, starting with 19,703 men and reaching a strength of 208,374 on 15 December. More than 81,000 men were enlisted during a two-month period in the fall. By 30 June, this year, the National Guard is expected to stand at approximately 271,000, of which 250,000 will be in Army units and 21,000 in Air units.—Department of the Army.



## Higher Training for Combined Command

Digested by the **MILITARY REVIEW** from an article by General Sir William Slim, Commandant of the Imperial Defense College, in "The Journal of the Royal United Service Institution" (Great Britain) November 1947.

BEFORE we start to make anything it is as well to be clear what kind of article we are trying to turn out. In this case, it is men—a special kind of men, those capable of commanding combined forces in war. What sort of men do we want for that?

### Qualifications

Modern conditions have made all operations, even small ones, combined; but what we are considering here is high command—the command of large forces on the level from Army Commander to Supreme Commander. We must aim, therefore, at producing, not merely officers who can command forces of their own Service in cooperation with others, but who are capable of exercising operational command of *all* services—fighting and civil. You will note I include civil. An officer who reaches high command in war will almost certainly find himself confronted with great problems of civil administration; he may, indeed, be responsible for every aspect of the government of a whole nation. This, if at the same time he is conducting one or two major campaigns, is no ordinary task, and requires no ordinary man. It needs a man with many qualities,

but, of the many, certain are, I think, basic.

### Will and Judgment

Something tougher than cooperative charm is required. The first duty of any commander is to command; to make decisions and to see that they are carried out. Now, to make the right decisions, he needs judgment; to force them through, as he will have to, against the opposition of the enemy, of unwilling allies, of his own distracted politicians and of doubting subordinates, he needs above all, strength of will. I would put this exceptional determination, this power to persist until by a mixture of persuasion, force and example he has compelled others to do what *he* wants, as the first quality of a commander. Without it he cannot be a leader at all. But the more he has it, unless it is directed by sound judgment, the more will it be a costly, dangerous and perhaps fatal quality. The fanatical determination of the Japanese commanders to force through their rigid plans was a weakness which we were able more than once to exploit. Our prospective higher commander must, therefore, have in a marked degree and in combination, strength of will and soundness of judgment.

### Flexibility of Mind

A man who has these will be a commander, but if he is to be fit for *high* command, he must have a third attribute. Not only do tactics and techniques change constantly and rapidly in modern war, but the whole background against which it is fought may alter almost as quickly. To these, often startling, variations on all levels the commander must be able immediately to attune himself and to readjust his plans. More than ever, too, in these days of scientific advance will suggestions for new weapons, new methods, be constantly put forward. Revolutionary ideas will often be advocated by experts, men who have great knowledge in technical, but usually limited, fields. They will urge them with a faith and persuasiveness equalled only by the vehemence with which other experts will refute them. The commander must be receptive to new ideas and quick to appreciate their application to his problems, but he must be able to distinguish the valuable and practical from the fantastic. He must have imagination—but *controlled* imagination. This side of his character is best described, I think, by saying he must have flexibility of mind. And here comes a conflict which has been the ruin of many commanders—the holding of the balance between strength of will and flexibility of mind. This is not easy to maintain and, unless both qualities are a natural growth implanted in the character, one or the other will predominate to a dangerous extent. The mark of the successful commander is that he never allows strength to degenerate into obstinacy or flexibility into vacillation.

### Character

If the man we are trying to find has strength of will and soundness of judgment he is likely to be a successful, even if a limited, commander. If added to these is flexibility of mind, he will certainly be a successful commander—perhaps a great one. But, if he is to hold the highest levels,

he must be more than a great commander in the field, he must be in himself a great man. That means that all these qualities of will, judgment and mind must be based in an essential honesty of character. He must have a massive and simple integrity. A major ingredient of this is, of course, moral courage. He must be as big as his job, which in the long run means he must not be afraid of losing it. He must not pander to popularity and applause. He must be bigger than these things—and more simple.

I believe, too, he must show this integrity in his own way of life. Otherwise, as long as he is successful he may be followed, but he will not be trusted to the last. It is good that it should be so, for the only foundations that will stand under the final strain are the moral ones. When a commander has these things in himself, those who deal with him will feel them and they will inspire an unshakable confidence.

I have enumerated a formidable list of the basic qualities our higher commander should possess—strength of will, soundness of judgment, flexibility of mind, integrity of character. You will not have failed to observe that none of these is the sort of thing that it is easy to teach. Indeed, there is a great deal of doubt whether they can be taught at all. It is, at any rate, certain that the later in life their inculcation is begun the more difficult it becomes. I believe myself that the seeds of all these qualities are planted, if they are planted at all, in the child, long before he grows up, by his parents, his home influence, his schooling and his early religion. Later in adolescence and manhood, given the opportunity, they can be developed, but it is no use watering the ground if the seed is not there.

### Selection

Our first problem in the production of higher commanders is not one of training, but of selection—how to get hold of the youth who is a potential leader.

As long as Conscription is in force, the problem of getting the potential leaders into the Services is simplified because, automatically, we get a cross-section of the youth of the country. This, although I have never heard it mentioned as such, is from the Services' point of view one of the greatest benefits of Conscription because, somewhere in the herd, under our hands, are the future champions. It is for us to recognize them, persuade them to adopt the profession of arms, and give them the opportunities to develop.

In the broadest sense selection should thus start with the arrival of the recruit. The youth who shows courage, intelligence—not necessarily education—and character well above the average, should be early recognized and earmarked for training as an officer. It is important that such a youth should not be left too long in the ranks. The sooner he gets into the officer atmosphere with its higher standards, its more unselfish outlook, and its greater demands on self-reliance and leadership, the better. We are not at this stage attempting to pick out young Eisenhowers; we are out to get good, efficient junior officers. The responsibility of Commanding Officers is great and, if they fulfill it properly, our future higher commanders will surmount the first obstacle—a very real one in peace time—the obtaining of a Commission. We shall have thus a wide and firm base for our pyramid of selection.

Again, at the Cadet College or University to which they pass, the object of selection should not be to earmark future *Supremos*. It is still too early. The process here should be weeding rather than forcing—the throwing out of any who show themselves to be below standard either in ability or character. The fault of our Cadet Colleges, at least in the Army, has been in the past that we have hesitated to weed drastically enough. It is, I am convinced, better to fall below establishment in officers than to fill up with inferior

material; better ten first-class officers than ten good and ten indifferent. At the same time, in this weeding out we should be careful not to measure too much by a standard pattern. Allowance must be made for the young man who is different—even a bit odd. We were not always very tolerant of variety in the past. We must make room for those who have the basic qualities of leadership even if they do not conform to pattern in some other ways.

### Training

If we are going to have a choice of higher commanders later, the next few years of the young officer's service are tremendously important. Too often in the past these years in peace, instead of developing his qualities, blunted them. He had neither enough work to keep him interested and occupied, nor had he the scope to exercise his judgment and his powers of leadership. If, after ten consecutive years of peace-time soldiering in many battalions, a young officer was ever likely to be fit for more than unit command, he was a very exceptional fellow. The Navy and the Indian Army were better at giving responsibility early, and they benefitted by it, for the only way to develop latent powers of leadership is by constantly using them.

There is another aspect of preparation for high command which should receive more attention at this period than it often does—experience in administration. Now that the legions are being called home, many young officers will pass the bulk of their early service either in this country or in Germany, where so much in the way of administration is laid on for them. Not only may they lack actual practice in the many sides of supply, transport and man management but they may come to think that such matters may be left to others whose special business they are. I always think it is a pity that in the British Army the Quartermaster belongs to a class of professional Quartermasters. It seems to me

that a system by which the ordinary junior regimental officers would take their tour of duty as Quartermaster in their units would be a better arrangement. It would be much more valuable for an officer who reached command level to have been a Quartermaster than to have been an Adjutant. A higher commander must have a wide knowledge of administration, and the sooner he begins to get it the better. Equal with the need of the potential commander for administrative experience is his need for broadening his knowledge of men—and not only of men in uniform. I believe it would pay the Services to encourage junior officers in the first five or six years of their service to take leave for one year, and spend it as an ordinary working man in industry—as miners, steel workers, railway men or agricultural laborers. A commander must never lose the human touch with his men and, if he is to command great wartime armies, fleets and air forces, he must instinctively understand the civilian workers who will form them. The best way to do that is, as a young man, to work with them as one of them.

### The Staff Colleges

The first real move towards selection for eventual higher command should come after the young officer has had five or six years regimental and extra-regimental service. This should be enough for his Commanding Officer and Brigadiers or equivalents to say he has shown the qualities required in a sufficiently marked degree. He should then be encouraged to enter his Service Staff College. Here his instructors should be able to make a reasonably accurate assessment of his present worth and future growth. Then, as they pass out of the Staff College, a few selected officers can for the first time, without undue publicity, be noted for special attention in their careers. There may, in fact will, be one or two who have not passed through the Staff Colleges who will justify inclusion in such a category. They

should be equally watched and given opportunities. This first selection should include officers likely to reach either high command or the most important staff appointments.

To a considerable extent from now on the careers of these officers should be mapped out by the Military Secretary or his equivalent in the other Services. The main requirements are to provide them with both command and staff experience of as great a variety as possible and to bring them into working contact with the other Services, civil authorities, science and industry. The Military Secretary and his other Service brethren have already a difficult enough assignment, and to make them fairy godmothers to a number of potential supreme commanders is to add a very difficult task to their burden, but it is the only way in which the selected officers can be assured of the right experience. One of the greatest difficulties will be to space the various appointments in time, so that the officer will, after passing through the Joint Services Staff College, arrive at his first Colonel's or Brigadier's appointment at an early enough age—not later, I think, than forty.

The officers thus earmarked will gradually show themselves to be better fitted to become either commanders or staff officers. A few exceptional ones will shine as both. There is a distinction between the make-up of the commander and of the staff officers, certainly on the lower levels and, I think, on the higher too, even if it is only that the staff officer should be very hardworking, and the commander preferably have a tinge of idleness in his composition. I once discussed this difference in type between commander and staff officer with General Eisenhower. While he agreed that often a good commander would not make a good staff officer, he would not admit that a man could be a good staff officer and not be also a good commander. He said that at the high-



er levels, the staff officer had not only to lead and control a large staff, but frequently to act and make decisions for his commander. If he was to do this, he must be himself a commander. The General added that this was the only thing on which he had differed seriously from his British Allies. However this may be, by the time our selected officer has held his first Brigadier or equivalent appointment for a year or two, either on the staff or in command, we should be able to judge the likelihood of his going much higher. If we seemed to have picked a winner, he should be nominated to the Imperial Defense College, where for a year he will study, with the pick of the other Services, the Civil Service, scientists and of all the Dominion Services, the problems of defense in their widest aspect.

#### The Imperial Defense College

This will normally be the third staff college the officer will have attended on his progress to high command. It seems a lot. Do we, in the fighting Services, overdo this business of education? I do not think so. I believe that if there was one kind of institution in the Empire that paid a big dividend in the last war it was these colleges. That we were able to avoid the complete destruction of our small and ill-equipped forces in the early stages of the war was in large measure due to the fact that all Services had commanders and staff officers trained to a high pitch of efficiency, cooperation and mutual understanding. And it was these colleges which produced them, while their countrymen were laughing at "Colonel Blimp." In whatever the hard economic facts of our situation today compel the Services to economize, it should not be in such educational establishments. Difficult as it will be, if we have another war, to train fighting men and to provide equipment, it will be more than difficult, it will be impossible, to produce competent commanders and staff officers in the time

we are likely to get. They must be ready at the start.

These colleges, especially the Joint Staff College and the Imperial Defense College, are in effect the only places where theoretical training in high command is obtainable. As the number of officers of the fighting and civil Services, who have had opportunity to see that high command at work and to take even subordinate parts in its machine, dwindles, so does the importance of these places increase. As science advances its horizons, as the balance of power among nations changes, as fresh industrial potentials emerge, and as the mentality of the religious wars of the past reappears in the world, so does the vital necessity increase for the training of the men—Service or civilian—who will face and handle these forces. At a stage in their careers just before they begin to enter on higher responsibilities it is most important that selected officers should have an opportunity, free from the pressure of everyday business, quietly to study the major aspects of modern total war. This period is made immeasurably more valuable when it brings together those officers of the fighting Services, the civil Services and the scientific departments who are themselves likely in a few years to hold key appointments in national defense.

#### High Command

After passing out of the Imperial Defense College, the officers of the fighting Services should, in due course, be given their first appointments of Flag, General and Air rank. Thence onwards it should not be too difficult to pick out those who will climb to the next rung, or to separate those clearly marked as outstanding commanders from those whose capabilities and character fit them best for high staff appointments.

When all is said, we come back to the fact that the best training for any command, most of all for high command, is

to exercise it. Right up the ladder we should aim at giving our potential commanders all the responsibility possible of the sort they will be asked to shoulder in war. That is one reason why I should like to see retained in peace certain commands under Supreme Commanders, who have operational control of all three Services. They will be required in war; indeed, they will be essential if we have allies. Unless we have Supreme Commanders in peace, not only shall we lack officers experienced in the special requirements of Supreme Commanders, but we shall invite confusion by changing organization and commanders after the war has begun.

In spite of our best efforts at ensuring the right selection, training and even experience in peace, there is one factor which is incalculable—war. The remorseless test of battle often finds wanting the selections of peace and sometimes, though more rarely, thrusts to the front a man who, without that stimulus, would have remained in the rear ranks. We have all seen instances of that—the brilliant peacetime exponent of strategy who cracked through some flaw in his character in war; the ordinary fellow on whom battle acted

as a tonic, until he was unrecognizable as his former rather dull self. We must be ready to seize on him when he appears in war, and to push him on, but what we have to do now, in peace, is to find and train the higher commanders with whom to begin the war.

This is not an impossible task. If we know what we require in our higher commanders we can produce them. We have the material, we have the tradition, we have the accumulated knowledge. We can, by insisting on a really high standard of ability and character for all officers, widen our first field for selection. We can, fairly early in their careers, ear-mark potential commanders. Then at stages we can direct the right officers into channels where they will gain experience and opportunities to develop all facets of leadership. At intervals they can be given periods of joint theoretical study and training. The thing to remember is that there is no doubt that where they exist the essential qualities of higher leadership can be developed—judgment by experience, determination by responsibility and flexibility by variety. In these days, we are all urged to produce—there is nothing a nation can produce more valuable than its future leaders.

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A Theater Commander charged with conducting combined operations must be possessed of unquestioned ingenuity, professional skill, tact, good judgment, and patience.

*General Jacob L. Devers*

## The Battle of Moscow

Translated and digested by the MILITARY REVIEW from an article by General Guillaume in "Revue Historique de l'Armée" (France) No. 3, 1947.

THE battle of Moscow was a battle of attrition of four months duration following a campaign of more than three months during which the opposing forces had already become exhausted. It took place over a front 350 kilometers wide and 300 kilometers deep. Actually, it was a series of battles.

The two German attacks of October and November were followed in December and January by reversals. Each side in turn scored important tactical successes. Large forces on several occasions were encircled and destroyed, but at no time was there a true strategic breakthrough. In January, the snow and the cold did not permit the Soviet command to exploit its victory fully.

For two months, the Germans stubbornly attempted to carry out their encircling maneuver, although the armored attacks on either side of Moscow which were to have brought the decision had been halted during the first few days. Surprise was no longer possible. The Soviet command was able to organize its defense on successive lines, and by bringing up fresh forces on 6 December was able to reverse the situation.

### German Forces

For the Germans the battle ended in a tank disaster. Fifteen hundred tanks were destroyed, the majority by artillery.

Out of twenty-four armored divisions at the disposal of the Germans in 1941, thirteen were engaged at Moscow. Of the twelve divisions of the Hoth and Hubner formations, which were charged with the encirclement on the north, seven were armored and two motorized; only three were normal infantry divisions. South of Moscow Guderian had seven divisions at his disposal of which four were armored and one motorized. Of the four divisions

in the attack on Kachira, three were armored.

It would appear that the terrain in the area should be favorable to the deployment of armored forces. But such was not the case. Regarded as a whole, the Moscow region is nothing more than an immense forest broken here and there by clearings, which are the only inhabited and cultivated spots.

The terrain is not only wooded, but it is often marshy. The first rains of autumn render travel difficult, except over the roads. This is particularly true of the area extending over 100 kilometers west and north of Moscow. Three large highways cross this zone, converging on the capital. All of them pass along the shores of lakes or the edges of marshes in several places. East of Mojaïsk, the Minsk highway is bordered on the south by the Nara marshes (Narskie Prudi), and on the north by the meandering course of the Moscova. Lake Istra absolutely bars the thirty kilometer interval which separates Istra from Solnetchnogorsk, that is to say, the Volokolamsk highway from the Leningrad highway. North of Solnetchnogorsk this latter highway is bordered by Lake Sine (Sineskoïzero).

### Antitank Defenses

The passages between these lakes and marshes are only narrow corridors admirably adapted to antitank obstacles, camouflaged on the edge of the forest.

Except for these three large roads, the lateral east-west communications which Hoth's and Hubner's forces were obliged to follow toward Dmitrov and Yakroma, are dirt roads which are very muddy when it rains. Between Solnetchnogorsk and Moscow Lake there is no gravelled road connecting the Leningrad highway with the Moscova-Volga canal.

When, after heavy losses, tanks succeeded in breaking their way through an obstacle and coming out into a clearing, they were stopped at the opposite edge of the forest by a new antitank ditch covered with new abatis. Back of this obstacle, antitank units were on the watch. These units were equipped with weapons which had but recently come from the factory. They fired point blank, when they were certain to hit their targets. In this

appears to have paralyzed and disconcerted the German Command.

### German Difficulties

It seems that in engaging nine armored divisions west and north of Moscow, the Germans did not realize the difficulties they were to encounter. They could not foresee that their advance would encounter new antitank weapons of surprising effectiveness, and having staked nearly



Soviet cavalry filtering through a wood.

way the Soviet 289th Antitank Artillery Regiment alone destroyed 189 tanks during the battle. It received the designation of "first antitank artillery regiment of the Guard." The 296th Antitank Artillery Regiment destroyed twenty-two tanks alone 24 November.

South of Moscow and beyond the Oka, forest is found only occasionally in the expanse of cultivated fields. Marshy areas are rare. This explains the rapid drive of Guderian's tanks to Kachira. In this sector, it was the stubborn defense of Tula which

everything on their armor, they did not have enough infantry north of Moscow to outflank the antitank obstacles through the forests. Moreover, the intervals were strongly held by large forces of Soviet infantry and cavalry, guided and supported by partisans. When tanks and trucks become involved in traffic jams on the roads, the fire of Soviet long-range artillery was disastrous.

For the first time in the war, German aviation was dominated by Soviet aviation. Soviet *Yak* fighters were at least the

equal of the *Messerschmidts*. Under fighter protection, the *Stormovik* planes attacked the German columns from low altitudes, destroying more than 400 tanks from 1 to 11 November. Intense night bombardments harassed vehicle columns on the congested roads.

Canalized by the terrain toward anti-tank obstacles which were defended by excellent artillery, lacking infantry for outflanking them, and harassed by superior aviation, the German armored division suffered heavy losses daily. They were gradually worn down by continual encounters against increasingly powerful resistance. Each bound, however short, cost more tanks and more men.

#### The "Russian Winter"

Such were the true causes of the German defeat at Moscow. But rather than recognize them the Germans resorted to fiction. They claimed that the battle had been won, not by the Red Army but by the "Russian winter." To accept this view would be to forget that the action started at the beginning of October, several weeks before the beginning of the severe cold season, and also to ignore that Hitler on 2 October exhorted his armies to win before the arrival of winter. Not until the start of the second phase of the offensive on 16 November did weather conditions render fighting more difficult. Moreover, even if the freezing weather caused great suffering among the troops, it froze the marshes and facilitated tank movement off the highways. Hitler's stubbornness was responsible for the German troops being caught in summer uniforms at temperatures of from minus 20 to 30 degrees centigrade. But when the winter battle began, was not the German cause at Moscow already definitely lost? The Soviet command, in spite of the danger which continued to hang over the capital as late as 6 December, had the situation well in hand. The battles of October and Novem-

ber proved that German armor was not invincible.

Indeed, Hitler continued to pursue his attacks in spite of the objections of his general staff, and refused to admit his defeat. His generals begged him to suspend the offensive and resume it in the spring, after communications could be re-established, the Soviet railway lines brought back to normal, and the units again filled out. He replied by a new order for attack.

When the Moscow defeat resulted, he punished the commanders for not having been able to carry out his plans. Brauchitsch was relieved on 23 December in the midst of battle. Von Bock was replaced by von Kluge, who in turn was replaced by Heinrich at the head of the Fourth Army. Guderian, after a stormy interview with Hitler at the latter's headquarters in East Prussia, was replaced by Schmidt.

One thousand five hundred tanks were destroyed at Moscow, but the losses in men were more severe. This was true because the losses affected the armored battle corps, which included many of the best German youth. The conquerors of Poland and France went down at Moscow. The tanks could be replaced, but not the crews.

From the strategic viewpoint, the defeat of von Bock's forces by General Jukov completed the picture of German deceptions on the Soviet front. It marked the complete collapse of the "Barbarossa" plan.

Although bled white, the German army was again able to assume the initiative in 1942, after the resupply and regrouping of its forces. But it was never again able to operate on several different fronts simultaneously, a fact which greatly facilitated the Soviet reaction.

Moreover, as the German forces drove deeper into Russia, their lines of communication were strained. Operating in hostile country, their liaison between front

and rear was threatened. Partisan action, prepared in peacetime, began to be felt, and this caused no small amount of worry to the German command.

### Soviet Situation

On the Soviet side, the Red army came through the test stronger than ever, in spite of severe losses. The early terror of German tanks suddenly disappeared. With its antitank artillery and *Stormoviks*, the Red army now felt able to destroy the armor which nothing previously had been able to stop.

The annihilation of the German units encircled in the Moscow forests completed

stroyed in the eyes of the German troops and the entire German people, who now lost their blind faith in the *Führer's* lucky star. This myth was also destroyed among the Red soldiers and the peoples of the Soviet union, and gave courage to the Allies and the subjugated peoples of Europe.

These were the consequences of the German defeat, from the military and political points of view. In World War II, the victory of the Red army at Moscow in December 1941 is no less important than was the victory won in September 1914 on the Marne by the French army in World War



German motor vehicles abandoned on the Medina Road in January 1942.

the work of inspiring in the Soviet infantry and cavalry a feeling of superiority which the reverses of the summer of 1942 were unable to destroy and which were still intact at the battle of Stalingrad.

The Red army, forgetting the disasters of the first months of war, regained confidence in its leaders and its weapons. It regained confidence in itself. During the four months of hand to hand fighting at Moscow, the Red soldiers gave proof of endurance, tenacity and sacrifice.

### The Myth of Invincibility

The myth of the invincibility of the German army was exploded by the victory of the Red army at Moscow. It was de-

I. Both mark a decisive turning point in the wars of conquest begun by Germany.

The battle of Moscow marked the beginning, on a world-wide scale, of the war of attrition. The era of Hitler's sensational exploits was ending. The German effort, strained to its limit at the beginning, was not able to continue indefinitely against the combined forces of the free world.

In 1942, the Red army underwent new tests over which it triumphed. But the defense of Stalingrad can not make us forget Moscow. At Moscow Hitler suffered his first defeat. It was there that his dream of conquest crumbled before the resistance of the Soviet army.



## Military Research in Sweden

Translated and digested by the MILITARY REVIEW from an article by Colonel T. A. Schmidt in "Kungl. Krigsvetenskaps-Akademiens Handlingar och Tidskrift" (Sweden) No. 7, 1947.

THE possibilities of technical advancement in the various fields of national defense are largely dependent on the scientific and technical research organizations of a nation. Many of the technical problems related to national defense are solved either wholly or in part by research agencies outside of the national defense organizations, and the latter are obliged to obtain their basic information, learn their methods of procedure, and obtain their trained research personnel from civil research and training institutions.

Basic research in Sweden is conducted primarily in institutions connected with the two Swedish universities, the high schools of Stockholm and Goteborg, and the Academy of Science. The more technical basic research is conducted in the technical high schools. Also of a basic nature is the research activity supported by the Academy of Engineering Sciences, which is conducted both by research workers in the technical high schools, certain research institutions which work under the Academy, and by industrial establishments.

### Basic Research

Research in the application of basic research has, in the main, been the task of industry itself, and is carried on by each individual concern for its own purposes and in its own laboratories. In high schools, universities and other scientific institutions, no small amount of research of this type is carried on at the request of industry. Present-day competition in the world's markets has impelled Swedish export industries, particularly, to set aside considerable sums for research.

Appropriations made to government research institutions are considered, usually, as the foundation of their work: pay

of personnel, purchase of equipment, care of apparatus, costs of experiment, etc. But in addition, some way must be found to obtain means of conducting other research activities of greater magnitude. In many countries it has been found necessary to establish a special, central organization for the furtherance of research, and for the administration and distribution of appropriations. In Sweden, such central organizations are designated as research councils. These councils can be of great importance to defense, for through them the national administration has organizations at its command which, if the need arises, can initiate military research on the problems of particular importance to defense. For this reason, the existence of a central organization with a knowledge of research institutions and their resources is advantageous in facilitating the transition to war research with its special requirements.

### Personnel

For technical military research, the services of scholars, engineers, soldiers, instrument makers, etc., are required. This personnel, adequately trained and thoroughly schooled in well equipped universities, high schools or research institutions, must be available. A research worker must have many years of training and a great amount of knowledge before his ability is fully developed. Unfortunately, we must admit that we are very deficient in these matters in Sweden. There are too few research workers and far too few technicians in nearly all fields.

Fortunately, a large step in the right direction was taken in 1946. Supported by the committee for scientific research, the education ecclesiastical minister proposed to the *Riksdag* a substantial increase in the appropriations to the univer-

sities and high schools, mainly to further scientific research. He declared: "It is a well known fact that scientific instruction and research in our country does not enjoy the organizational and economic support from the state that their fundamental importance justifies. The gap between appropriation requirements for university organizations and the economic resources at their disposal, a gap which even before the outbreak of World War II was evident, widened still further during the war. The already inadequate appropriations could not be increased, of course, during recent years. In certain cases they were, on the contrary, reduced. At the same time, the natural and medical sciences, especially in the case of the great powers which were engaged in hostilities, underwent a phenomenal development, thanks to systematic government support during the war. As a result, our country is in danger of being entirely out-distanced in scientific development by other countries."

#### Appropriations

The *Riksdag* passed the bills essentially as presented, and appropriated 7,200,000 kronor for scientific research and instruction in the universities and high schools, and 4,658,000 kronor for new construction for the budget year 1946-1947. Among the appropriations are 20,000 kronor for research in physiological acoustics; 1,000,000 kronor for research in aviation medicine; and 2,000,000 kronor for atomic energy research.

Technical research was also favored by the 1946 parliament. Thus, considerable increases in appropriations to technical high schools were made, for new research laboratories, expenses, equipment, and technical research. In addition, 8,700,000 kronor were appropriated for construction, and some 2,000,000 kronor provided for the establishment and equipment of new laboratories.

A large percentage of these appropriations are of a recurring nature. These

measures will considerably increase the research capabilities of Sweden. Unfortunately, however, it will be several years before many results can be expected.

The need of a research council to further research and distribute appropriations for various purposes has just been shown. At an earlier date in Sweden a state council for technical research, a medical research council and an agricultural research council were instituted. In the fall of 1946 a state research council for natural sciences was created.

The agricultural research council has some 250,000 kronor at its disposal for promoting research, while the annual appropriation for each of the other three is approximately 1,000,000 kronor. These councils are at present independent of one another, but the best form for obtaining the necessary cooperation is being studied. Great Britain, the United States, and the Soviet Union have combined their technical and scientific research under the control of a common research council. From the military point of view this would be wise in Sweden, also. Military representation in technical and scientific research is to be desired.

#### Technical Military Research

Before and during World War I, there was carried on in Sweden a certain amount of activity in the field of military technique, but little actual research occurred. A part of the research related to the production of domestic raw materials required in war, principally the manufacture of military equipment, was placed in the hands of the War Matériel Commission (*Krigsmaterielkommission*). During the 1920's it was realized that technical military research was necessary, partly for creating new combat means, and partly for creating from domestic materials the articles needed in the conduct of war.

Research at first was very limited, and was carried on by military authorities. In 1928, the Technical Preparedness Com-

mittee of the Academy of Engineering Sciences was started with the mission of furthering research in technical science of importance from the standpoint of war equipment. The committee was composed of members of the academy and administrative military authorities. It needed, however, its own laboratories or a technically functioning body, and for this reason its work consisted, largely, in the collection of projects and the promotion of these activities in various institutions. To a certain extent, results were obtained, especially in fields related to raw material supply.

### Chemical Warfare

In the field of war chemistry, various research problems were created by World War I. At the start of the 1920's these problems were taken up by the Okers Powder Works. But chief dependence was placed on information from other countries. An independent research project was initiated in 1926 by the Institution of Medicinal Chemistry at Lund, and in 1928 this activity was complemented by the work of the Institution of Physical Chemistry at Uppsala. The divided work, and the absence of contact with the military organization was, however, accompanied by great inconvenience. In 1936, therefore, the *Riksdag* established the National Defense Chemical Institute (*Försvarsväsendets Kemiska Anstalt*). The latter, completed in 1939, was Sweden's technical agency for chemical warfare and for dealing with other chemical problems of importance in defense. Thanks to this institution, it soon became possible to provide requirements for anti-gas defense.

Before the beginning of the war in 1939, technical communications research had largely been conducted by industry and was therefore directed toward those fields having a civil application. Work in wireless communication after the 1920's was carried on in the radio workshop of the field telegraph corps and underwent great

development. In 1940, a modern electrical laboratory was established and placed under the control of the army's ordnance department, but it was in charge of the signal communications regiment. The naval and air force administrations established smaller laboratories of this kind. On the initiative of the national inventors' society in 1942, there were undertaken extensive research activities in radar, which resulted in the production of the first Swedish radar sets.

The research and test sections of the present Army Fortification and Concrete Bureau have carried on extensive activities since 1940.

Research work in photography has been conducted by the General Staff photographic establishment, and that of the National Defense Staff.

### Research and Preparedness

In 1939, the Academy of Engineering Sciences took the initiative in the establishment of a Research and Preparedness Organization (*Forskningsens Beredskaps Organization*), which is an association for the purpose of furthering collaboration in the field of research of a technical nature, thereby collaborating in the strengthening of the nation's military and industrial preparedness. To begin with, the work of the FBO was largely concerned with technical aspects of national defense, but afterward extended to civil relief. This activity has been directed, mainly, toward urging research workers to attend meetings and work conferences, and dissemination of information on research methods and means.

The aviation committee of the Academy of Engineering Sciences began research work in 1920 in the technical field of flight, and this work was also carried on in the institutes of aviation technique of the technical high schools. At the present time, aviation research work for military purposes has largely been shifted to the Aviation Testing Institute.

In the fall of 1939, an association for the application of physics to national defense was created by the administrative bodies of the nation's institutions of physical science. After the Swedish national committee for physics assumed the direction of this work, the Institute of Military Physics was established with the mission of developing the methods and procedures for the production of new combat means.

### Defense Research Institute

Technical military research suffered greatly, however, because of the division of effort. In February 1943, the National Defense Association was created with the mission of expediting and coordinating military technical research and holding conferences relative to the institution and organization of anticipated research activities. This led to the establishment by the *Riksdag* in 1944 of the Defense Research Institute, which began its activities on 1 April 1945.

Military administrative authorities are, in general, responsible for the procurement, manufacture and development of all war matériel, each in its own field. A considerable amount of development work is conducted in the factories and institutions connected with defense, such as ammunition factories. Oker's Powder Factory, the naval yard, the Central Torpedo Works, the air force administration testing center, etc. The National Defense Research Institute helps these authorities, but must on its own initiative take up and work on new problems and new methods which may be of use in the conduct of war.

The work of the Institute, which is directly under the King, is mainly direction of scientific and technical research for military purposes, and the initial solution of problems concerning new equipment and methods.

The Institute also takes up, for closer

study, research problems assigned by the commander in chief or the defense branch chiefs. It must plan, in this connection, incidental research activities, distribute the tasks to state or private research organizations which may be available for the purpose, and, when these tasks are such that they ought not to be placed in the hands of any other research body, assume the task itself.

### Organization

The Defense Research Institute is directly under the authority of the King. It is controlled by a directive body. The Institute is organized in three departments. It has been strongly emphasized that a classical division, in accordance with the different branches of science, cannot be made, but such division serves the purpose of technical military research. This must be carried on horizontally, that is to say, every complicated problem must be attacked in accordance with the methods of several different branches of science. The departmental breakdown does not, therefore, coincide with the different branches of science, but generally speaking, Section I has taken over the activities of the Chemical Institute, and Section II the activities of the Institute of Military Physics, while problems relative to signal communications are handled by Section III.

The Institute's work is carried on at present in more or less temporary locations distributed throughout Stockholm and vicinity. A quick and effective solution of the location problem is necessary.

New equipment worked out by the Research Institute, or new methods discovered during development, usually undergo further development or study from the standpoint of manufacture or military service. During the war, private concerns could be called on by the administrative authorities for such work. Products which had been manufactured for civilian consumption were often found suitable, and

experimental work frequently resulted in orders which were economically advantageous to the firms concerned. The willingness of private concerns to place their property and experimental laboratories at the disposal of the government diminished after the war, when normal peacetime production was resumed.

Of course there are a certain number of laboratories in the national defense system where work can be done, as at ordnance stations, the navy yard and air force shops. But if one excepts the navy yard, they are not generally arranged for the type of work to be done. Private experimental laboratories, or developmental and applicational laboratories, are required to make perfected, from experimental, models. A fusion of these laboratories with the Research Institute should result in certain advantages.

The commander in chief is assisted, on his personal staff, by a regimental officer

for research business. Among other things, the latter must participate in the planning of research activity, and take care of matters arising from the joint use of military facilities. It is also his duty to facilitate cooperation between the various authorities and organizations of national defense, in matters relative to technical problems.

In 1944, the National Defense Research council proposed an annual budget for the Defense Research Institute of some 1,600,000 kronor. Since this proposal was made, the military importance of research has become even more important. Conscious of this, the military authorities have been forced to ask for considerably greater appropriations and the *Riksdag* has, to a large extent, agreed. Hence, the appropriations available to the Research Institute for the present budget year rose to some 4,500,000 kronor, and the King proposed an allowance of 4,800,000 kronor for next year.

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As a nation we stand to win or lose in any war of the future on our degree of scientific preparedness. Most of the battles of the past war were battles of scientific techniques. The enemy struck us first with many radical innovations, and in the early days of the conflict before our tremendous industrial and scientific potential had come into full play, our margin of success in retaliation was dangerously small.

*Major General Anthony C. McAuliffe*

## Future Cooperation of the Armed Forces

Translated and digested by the MILITARY REVIEW from an article by General Gaetano Cardona (Army) in "Rivista Aeronautica" (Italy) February-March 1947.

THE varied experiences of war have shown that all great conflicts are only an exaggeration of preceding wars. Enormous progress of science and industry leads us to believe that any new major conflicts will probably be inter-continental, and certainly of a disastrous nature.

Armed forces—ground, air and naval—will continue to exist, although more changed and specialized than in the past. Because of increasing complexity, unified command will be necessary. Such operations will require mutual understanding and unified training.

Cooperation of the armed forces will be similar to that in the past, although methods will vary. Thus, ground forces will be called on to conquer and defend points vital to air and naval forces, while air and naval forces must protect supply lines for ground forces and ocean routes for overseas operations.

Combined operations will be employed in attempts to cut enemy communication lines on land and water, and to destroy enemy bases and ports, especially industrial or commercial centers.

Naval forces will continue to need carrier-based aviation, and its land bases, defended by the three armed forces, will permit it to maneuver in space and time, dominating a given sector of the naval chess board.

However, operational directives of the air-naval forces, as well as of the air-ground forces will always be prompted by strategic concepts determined by the various phases of a war. The easiest, most effective, least hazardous, and most rapid strategic solutions will be chosen.

Naval and air forces will cooperate, therefore, to obtain maximum results with minimum means, especially to keep their

supply lines open and to cut those of the enemy.

With use of the atomic bomb, it will be possible to increase air-ground and air-naval operational capacity still more, whether for obtaining decisive results such as the defeat or paralysis of enemy forces or his merchant marine, or for the invasion of overseas territories.

### Air-Naval Supremacy

Air and naval supremacy, though limited in time and space to one operational sector, will be obtained by the combined action of pursuit aviation, and bombardment, torpedoing, or submarines. This supremacy will often be difficult to obtain, chiefly because of enemy offensive action in the air, and underwater defense. These measures may, indeed, be multiplied to the point where at times they will deny air, ground, or ocean areas to the belligerents. Under these conditions, only bombing attacks by long-range projectiles may be possible, but it can be foreseen that certain ocean areas will be no-man's areas analogous to the no-man's land areas of ground warfare.

In the interest of ocean traffic security, therefore, the most hazardous zones will be crossed at night and convoys will be escorted by war vessels and aircraft, for protection against enemy bombers and torpedo boats. While the mission of maintaining vigilance will fall to the lot of scouts, anti-submarine activity will be effected by small air units provided with special bombs.

As for naval landing operations, it will be necessary to conceal one's intentions from the enemy to gain surprise. It will be necessary to possess air supremacy in that operational sector, to keep operational plans secret, and to divert the attention of the enemy from the zone of operations by



means of continuous activity in the air and on the seas in different sectors.

During important operations, the use of radio for signal communications must be forbidden to avoid interception by the enemy. But the latter may be misled and deceived by false signal communications transmitted from points situated outside the sector of operations.

An air or naval force which is weaker than the corresponding enemy force will avoid a decisive battle and limit itself to blows dealt the enemy forces in sporadic action. Even more powerful air and naval forces will not always find it advantageous to provoke the enemy to decisive battle, and will limit themselves to paralyzing the corresponding forces of the enemy by keeping them at their bases and by inflicting heavy damage on the latter.

As a result, air and naval commanders, more than ground commanders, will need quickness of perception, and the ability to make rapid estimates and decisions in order to act in an effective and opportune manner. Indeed, the high speeds which will prevail in the future will render the various phases of an air or naval operation extremely variable and, for each new phase, new decisions will be required.

### **Inter-Dependent Forces**

The three armed forces, particularly ground-air and naval-air combinations, will become increasingly inter-dependent as technical progress tends to render common hitherto differentiated purposes, objectives and methods.

Aviation is indispensable to both ground and naval operations, since aircraft join in obtaining naval and ground supremacy. Indeed, with their constant reconnaissance, aircraft will provide valuable information, and with bombing or torpedo attacks by aircraft or long-range projectiles, they will join in the destruction or neutralization of the enemy potential at the same time

protecting their own ground and naval forces.

Naval-air cooperation, now a necessity, will become more and more effective, thanks to the super-battleship, super-aircraft, and long-range projectiles.

Naval-air supremacy will thus be greatly extended, including the possibility of waging war from one continent to the other.

Naval aviation will become, therefore, more and more able to precede, accompany and conclude any naval operations with its vast ranging reconnaissance; it will be possible to foresee furious and truly decisive air-naval battles, and because of great operational radius, its aircraft will be able to guarantee an ample margin of strategic and tactical security around naval formations, thus assuring freedom of action.

The action of large units will have to be perfectly coordinated with that of large air units in order to produce unified action with a community of aims, objectives and cooperation.

Naval forces, together with air forces, will also be able to neutralize and paralyze the armed forces of the enemy by blockading, harassing, pursuing, and mining supply lines and enemy ports.

The most frequent cooperation will be ground-air. Aviation will not only insure air supremacy, at least in operational sectors, but also render all possible aid in the most varied situations, terrain and climate.

Maximum cooperation will exist between naval, ground and air forces in blockading or counter-blockading operations, and in naval landing operations. The latter will always be necessary when it is necessary to take possession of enemy territory, even though the occupation is prepared with long-range atomic projectiles.

### **Technical Progress**

Recent technical progress in physics and chemistry will make atomic and rock-

et-propelled projectiles more effective. This progress will also be seen in the application of radar and television, and atomic radio-activity.

Due to the increased power and mobility of the new means of combat, a notable increase in offensive and defensive capacity will result. If other known and perfected technical means are joined to all this, a radical technical revolution may be predicted in every military organization.

Incidentally a future world conflict may be of brief duration, for there will be no time to prepare for total war once hostilities have started.

It is probable that the decision in a future conflict, with its strategy and tactics based on annihilation, will most likely result from total attrition such as was witnessed in World War II. The disadvantage will be on the side that permits its adversary to get a head start on military dispositions, peacetime organization, military means, or operational methods.

We can foresee, then, these tendencies of the near future:

a. Mechanized ground forces becoming much more specialized, powerfully armed and highly trained, and provided with automatic weapons of high ballistic powers and explosives of great destructive force.

b. Naval forces with fighting units which are rapid, powerful, unsinkable and, perhaps, capable of submersion.

c. Increasingly perfected air forces, with transsonic, very powerful, jet-propelled planes and long-range rocket projectiles.

Long-range rocket projectiles should be employed by the air force, since this is the only specialized branch capable of quick verification of the destructive effects of this projectile.

Cooperation should, then, be perfected not only between different armed forces but also between various branches of the same force.

It will always be necessary, however,

to seek relative superiority at the point adjudged decisive and during the entire time required for the decision.

Ground warfare must, therefore, become more and more integrated with aerial warfare, and naval warfare will become increasingly of the air-naval type.

It is possible to foresee strategic bombing and torpedo attacks both by night and day, conducted almost entirely by radio-controlled jet aircraft, and by radio-directed, long-range rocket projectiles against which defense will be difficult. Aviation will be adapted to the occupation of terrain zones by increasing employment of paratroops, large airborne units and air supply.

Thus, aviation itself must become more and more efficient, prepared to withstand the inevitable initial crisis of a future war. The same may be said of anti-aircraft and of frontier and coastal defense.

In the face of the increasing complexity of the means of combat, dynamic strategic and tactical conduct of armed forces will become more and more difficult. Consequently, operations will become more complex, requiring a breadth of vision and concept.

Ground, air, and naval forces are now interdependent and must know one another's possibilities. Liaison must exist, therefore, between all grades as well as between the various armed forces for the successful conduct of operations.

But tactics must be able to pave the way for strategy, just as the latter must prepare victory for the former by singleness of purpose, community of objective, results corresponding to aims, effects proportional to results, efforts corresponding to effects, and means corresponding to efforts.

#### Future Cooperation

Future cooperation between armed forces will thus require:

Unity of command, with echelonment of functions.

Closest coordination of all interdependent, strategic and tactical combinations, thus avoiding dispersion of energy.

The most rational discipline of will and mind, and intelligent, collaborative initiative by all grades.

Concentration of effort for the annihilation of the adversary.

Powerful offensive and defensive armament, taking advantage of new technical inventions, including launching sites for long-range projectiles.

Thorough mechanization of ground forces.

Aviation perfected along all its special lines, with a logically planned network of invulnerable bases for offensive or defensive operations, and possessing great powers of penetration, strategic concentration or evasion and great operational possibilities.

A logically planned antiaircraft organization.

A navy provided with all the most modern means of combat, with effective organization, great power, speed, range, and capacity for remaining afloat, and a suitable system of bases.

Maximum efficiency and offensive and defensive maneuverability on the part of the three armed forces, in coordinated cooperation, to obtain the necessary superiority over the enemy in time and space.

Decision, boldness, and unshakable will and tenacity, deriving from a military spirit of highest quality, for facing the exacting demands of future war and for crushing the will of the enemy.

In short, there must be a strategic and tactical theory of operation which shall be common to all armed forces—simple, clear, adaptable to the various forces, but reduced to essentials and sufficiently elastic to change with the incessant advances of science and industry.

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The unity of command in the field, so vital to our success, was not easily achieved. When war came, at Pearl Harbor, we had joint command. It was not until we surprised the enemy in North Africa that the first large-scale example of unified command emerged. But it was a new device and there were many difficulties which yet remained to be overcome. All of these had to be met and surmounted during actual operations when lives were at stake. In my opinion, these difficulties grew directly from the traditional separation of the Army and Navy which is the inevitable outcome of the present organization [before unification] of our military departments. Separation at the top necessarily fosters separation all along the line.

*General of the Army Dwight D. Eisenhower*

## Administrative Problems in Crete

Digested by the MILITARY REVIEW from an article by Brigadier G. S. Brunskill in "The Army Quarterly" (Great Britain) July 1947.

### Geography

To understand the Crete campaign, it is essential to visualize the military geography of the island, especially as regards airfields, roads and ports.

There were three airfields, Heraklion, Retimo and Maleme, with a possibility of rapidly constructing another south of Heraklion. The defense of these against airborne attack was the vital consideration. Other vital points were Suda Bay port and base and certain potential landing beaches, notably near Retimo and between Canea and Maleme.

There was only one east-west road fit for mechanical transport and this ran close to the north coast along almost its entire length, linking Heraklion (Candia), Retimo, Suda Bay, Canea and Maleme. Then to the south the only roads which actually reached the shore were from Heraklion to Tymbaki and from Maleme to Selinos.

Suda Bay was the only port which would take an ocean-going ship. For ships from the bases in Egypt this meant a circuitous route exposed to air attack in the narrow waters at either end of the island. Crete was closer to the German airfields in Greece than it was to ours in Libya. Suda Bay was a very good shallow anchorage, but there was not a single crane ashore and the one jetty was congested by a transit shed, built in the middle of it, which restricted the turn-around of trucks. On the north coast, Retimo could take a smaller coaster and Heraklion could, and did, take up to a destroyer. On the south coast there were no ports, but there were several places where off-loading to beaches or to rapidly constructed jetties could have taken place had these been served by roads fit for mechanical transport. In particular, Sfakia was not road-served: the last five

miles from the top of the coastal range to the little bay were traversed by goat-paths only. There were neither time, sappers nor equipment to remedy this between 1 May 1941, when full preparation for defense was ordered, and the opening of the German offensive on 18 May.

### The Outset

The original garrison of one infantry brigade, plus some coast defense and anti-aircraft troops and small ancillary services was more or less equipped to war scales. The reinforcements—the Mobile Naval Base Depot Organization (MNBDO), two regular battalions and Layforce Commando elements—arrived with full equipment except for transport: MNBDO was actually the only formation which brought any transport at all, except the odd trucks deck-loaded on transports.

The bulk of the garrison was made up of "W" Force troops from Greece which, by force of naval circumstances, had arrived in Crete instead of Egypt. From the point of view of readiness for war in Crete the best of these "W" Force troops were New Zealand and Australian infantry battalions, which had managed to bring with them practically all their rifles and Bren guns, plus some antitank rifles and a few machine guns, some without tripods. The best equipped of these men had a greatcoat and their personal equipment, but many had not even that. Above all, there was no unit equipment or heavier weapons whatsoever.

As regards reception, Headquarters had done the best they could, considering that they had no transport available at all, no stocks of unit equipment, only few accommodation stores and no personnel available to staff reception camps. They had selected areas where there was water

and olive tree cover, to which all arrivals were directed to make their way on foot. Thence men were directed on to separate areas for Australians, New Zealand and other British troops.

It was naturally, therefore, rare to find formed bodies of men led along the road to their appropriate camps by their own officers. In general there was a stream of tired humans wanting to rest and recuperate from the strain of the short campaign in Greece. In some cases, among the toughest and least trained men, there was an active revulsion against military discipline and advantage was taken of the opportunities offered to avoid being brought under control. In consequence for the first ten days, at least, there were a number of men at large, many armed with rifles, living as tramps in the hills and olive groves.

#### Steps to Improve Conditions

Camp staffs were appointed; in the case of British camps these were from among artillery units from "W" Force, for whom there were then no guns. Appeal was made to all units originally in Crete to hand in as much as they could of their cook-pots, etc., on the principle that all troops should have their share of what there was. The scale of blankets was reduced from three to one per man and in this way sufficient were obtained for every man to have one.

The problem of bringing all loose elements under control, however, was much more difficult, largely owing to the impossibility of giving the military police any transport. However, a curfew for troops at 1800 daily was introduced in the Suda-Canea area, and it was promulgated that all men not in formed units or under camp control would be treated as deserters. Moreover the gradual organization of some gunners into gunner units and of others into improvised units, armed with rifles only, helped to clear things up. Everything possible was also

done to simplify the procedure for disposing of serious disciplinary cases.

In addition, every effort was made to get rid as soon as possible of all surplus British personnel and all prisoners of war, to ease the maintenance problem as much as for any other reason. Some were dispatched to Egypt, but not as many as desired at the outset. This was due to lack of escorted shipping and partly to its being found impossible to equip a fair proportion with captured Italian guns or to turn them into improvised rifle units.

#### Strengths to be Maintained

As a result, the total strength of British troops to be maintained remained until the end, in the region of 30,000, although the fighting strength was actually less than that of a division and equipment and transport for even the fighting portion of the force were woefully lacking. In addition, there were also the following to be supplied: Greek Army, 14,000; Prisoners of War, 15,000; Greek populations, 400,000.

It was apparent at the outset that the supplies needed for all these must be imported by one authority, and that "Q" Branch Force HQ would have to act direct with GHQ Middle East if there was to be any hope of a successful solution.

The Greek army units in Crete had no transport, practically no arms or equipment and no resources of food at all; they were merely recruit units and there was no organization. A successful meeting was held between the Brigadier in charge of administration and the Greek Army Chief of Staff, as a result of which a simple organization of Greek Army depots and ancillary services was to result under the guidance of a small British staff. However, the German attack opened before anything was achieved. This British staff was, of course, to act in respect of the needs of the Greek civil population as well as the Greek Army. Unfortunately as the harvest was not yet gathered the

food situation of the civil population was at its worst. To add to the difficulties there was no effective civil government and therefore no organization for clearance of food landed at Suda, or for efficient distribution throughout the island. Moreover, all civil motor transport and nearly all animals had been requisitioned by the Greek Government for the campaign on the mainland.

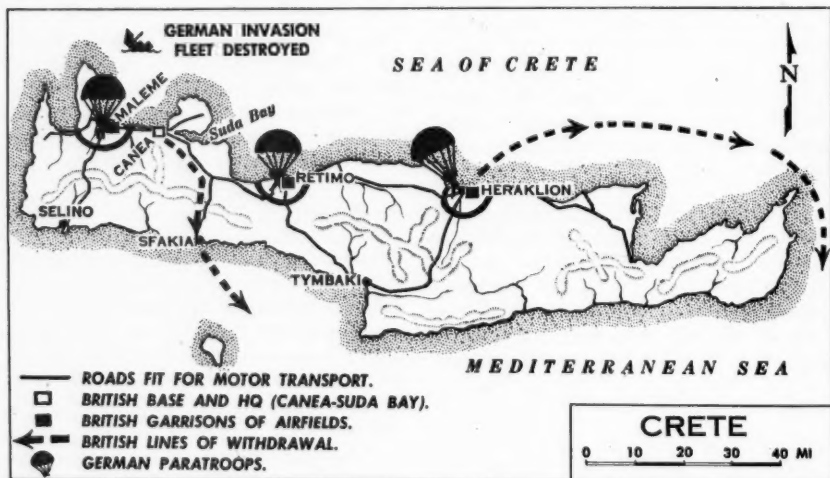
The prisoners of war were naturally on short rations; as a result, it was necessary to give some food to the eight Greek

ish infantry brigade less one battalion plus two Australian battalions. In addition one further regular British battalion from Egypt was disembarked at Heraklion by warship and one put ashore at Tymbaki, whence it marched across the island except for a portion left behind.

*Retimo*:—An Australian composite infantry brigade of the equivalent of four battalions from Greece.

*Maleme*—*Galatos*:—The New Zealand Division of nine battalions.

*Suda*:—The third regular battalion of



battalions actually employed in sectors and to the prisoners of war.

#### Initial Course of Battle

Owing to poor communications, General Freyberg had no alternative to splitting up his small force into garrisons, mainly for the defense of the airdromes and the most likely beaches. The force was therefore organized into the Heraklion, Retimo and Maleme fighting sectors, with a Central Sector containing the base and the small reserve. The infantry were distributed as follows:

*Heraklion*:—The original regular Brit-

ish infantry brigade, the remnants of the Rangers from Greece, the Marine battalion of MNBDO and the miscellaneous men of all sources organized into the "Perivolians." Just before the withdrawal two commandos from Egypt were added. From among these the Force Reserve was earmarked. To swell this the Australian Brigade HQ and one Australian battalion was withdrawn from Retimo just before the heavy assault. None of these troops were, however, mobile.

British Artillery were entirely lacking, but some captured Italian pieces with a



little ammunition arrived from Egypt and were sent to sectors at the last moment. Six infantry tanks were landed and distributed, two to each of the three outer sectors. A few light tanks were also allotted to Maleme Sector, but they were old and played no real part in the battle. Equipped sappers consisted of one section only; the few batteries of anti-aircraft artillery were allotted to Suda Bay defense except for a few guns at the small ports of Heraklion and Retimo. The total number of motor vehicles in the force was little over 100.

*Force HQ* was near the eastern outskirts of Canea, on the promontory bounding Suda Bay to the north. HQ RAF rightly put themselves alongside and the Senior Naval Officer ashore naturally had to remain at Suda. Cooperation was excellent throughout, a welcome contrast to the experience in Greece.

After intensive air bombing attacks on the port and garrisons as well as the towns, the actual assault opened on the morning of 18 May with parachute and glider landings.

At Heraklion these were almost entirely mopped up, at least 1,000 being killed with very few British casualties.

At Retimo there was an almost entire destruction of a smaller force of paratroops. However, a small body fortified a strong stone-walled churchyard on the one road just west of Retimo. Counterattacks by the Retimo garrison and by the Force Reserve failed to dislodge these.

In the Maleme-Galatos sector the initial enemy assault was more successful. Paratroops and some gliders were successfully landed not only on the outskirts of Maleme airdrome but also in the valley south of Galatops, where they advanced and cut the main road.

They were driven clear of the road, but continued to cause embarrassment. For some time no reinforcement by air arrived and an attempted seaborne assault

was destroyed by the Royal Navy. We now know that the enemy were undecided as to whether to press home the assault, but eventually they landed more paratroops in the Maleme area, gained physical possession of the airdrome and immediately poured in their troop-carrying aircraft regardless of crashes and losses from our fire.

In the end the attacks by these troops, supported by low-flying air attacks and by flank attacks against the one road, pushed back the New Zealanders. Our few aircraft had by this time been destroyed, either in the air or on the ground, and the gallant attempt of a few flights based on Egypt failed to affect the course of the battle.

#### Maintenance Plan

It was neither feasible nor desirable to alter the layout of the main base depots, which were well dispersed and concealed in the olive groves close to Suda Port. These contained roughly thirty days' food for 30,000 men and some small arms ammunition, but little else. Immediately Crete Force HQ was organized on 1 May and the general distribution of troops was decided, steps were taken to establish field supply dumps of approximately fifteen days' rations, ammunition and petrol in the outlying sectors of Heraklion, Retimo and Maleme. The location of these in sectors was left to sector commands: all that was laid down was that each unit must hold three days' rations in addition to the field supply dump stocks and that anything in excess of this held by units would be in diminution of such stocks. All ammunition and all defense stores were allocated to sectors as and when they arrived, and except in the last stages there were practically no stocks retained in the Ordnance or Royal Engineers depots at Suda Bay. The first German parachute attack included the landing of some gliders astride the main Canea-Suda road, so that access to the main base depots was partially denied.

In consequence, when that situation was cleaned up, dumps of rations, gasoline and ammunition were established also in the outskirts of Canea itself, where they would be readily accessible for distribution by road east or west. Every effort was made to utilize local resources, but these were limited practically to supply of vegetables and some fruit and the baking of bread in the early static days.

Throughout the short campaign there was an acute shortage of medical stores. The proportion of killed was low, but the rate of comparatively serious and walking wounded cases was high.

In addition to shortages of essential equipment for cooking, etc., and other hardships, there was also the complete lack of amenities for the troops. Under such conditions these are essential as a restorative of morale.

#### Suda Port Clearance

Especially after experience in Greece it was obvious from the outset that there was grave danger of air attack drastically restricting the tonnage which could be cleared through Suda. Immediate steps were therefore taken to warn GHQ of the possibility, to put some AA defense at Heraklion and to reconnoiter the southern beaches from the point of view of immediate use or possible development. In addition complete lists were at once forwarded to GHQ giving full details of all essentials for the British and Greek armies as well as the civil population. These were necessarily based on a modest program of building up fifteen days' reserve by 1 June, twenty-two days by 15 June and thirty days by 1 July. All non-essentials, such as tentage, were ruthlessly cut out.

The tonnage cleared through Suda was, for several days, up to at least 700 tons a day, working by day in the face of enemy attack each evening by aircraft based on Greece. There was, however, a perpetual shortage of transport and the usual other difficulties arising out of the

use of a port with no shore facilities, a marked shortage of lighters, no ship-repair facilities and, above all, a hurriedly assembled, inexperienced staff.

As in Greece, air alarms in the port were abolished and work continued until actual air attack took place, each small detachment or working party taking cover when they thought it essential. However, at a later stage the scale and suddenness of dive-bombing attack became so great that the presence of enemy aircraft in the neighborhood resulted in the stoppage of all work. Resort was made to night work, but in the absence of an elaborate, well-organized system this could not be expected to yield much result. In particular, a large proportion of the ships being discharged were damaged by hits or near misses and in nearly every case their engines ceased to function. As they had no ancillary engines in working order for the winches and there was no ancillary lighting system, power had to be provided by putting a small ship alongside. Moreover, the ships' civil crews abandoned their ships, and soldiers acting as winchmen and stevedores found great difficulty in organizing their work in the dark without the crews' assistance.

There were also questions of slow turnaround of transport in the depots as well as in the port, guards and military police, meals for labor, stevedores and transport drivers, organization of air defense trenches and medical arrangements, fire-fighting squads, etc. In Suda, as formerly in the Pyraeus, it was found necessary to appoint a senior combatant officer, without an office, to supervise in the port area without interfering with the technical working.

To the greatest possible extent supply to sectors was made by sea rather than by road owing to the desperate shortage of transport. This alternative gradually fell away in capacity—Greek crews would not man their ships; it was

difficult to get hold of sound boats; and lighters broke down and were sunk. Volunteer military crews were called for and some actually employed, but the difficulties were legion.

Tymbaki and Selinos Castelli were the only places on the south coast served by road. Owing to enemy action Tymbaki was only accessible to the Heraklion sector and Selinos Castelli was rendered inaccessible. Hopes of quick construction getting through to other places—notably Sfakia—were doomed to disappointment. Sfakia was typical of the south coast of Crete: the road ended at the top of an escarpment leaving five miles of mule-trails to the coast.

#### **Development of an Acute Maintenance Situation**

To meet all essential current needs and build up reserves it was decided to aim at a clearance of 30,000 tons a month, although it was recognized that some 20,000 might have to suffice.

The first plan was to have a fortnightly convoy, but this was amended to clearing weekly, through Suda, two fast ships of 2,500 tons each with an additional specially loaded one fortnightly, cleared at Heraklion, chiefly for Greek needs.

When the loss of shipping at Suda became acute, anti-aircraft defenses were concentrated in an umbrella over the pier and quay. The majority of ships sent from Egypt, however, were sunk on the way or burned out in Suda Bay, and it soon became evident that maintenance through Suda with the type of ships available was not possible. The only alternative was a daily delivery of small quantities by fast ships, getting in, discharging and getting away under cover of darkness. For this neither the ships nor escorts were available and for delivery of transport vehicles it was not a feasible proposition at all. As a last resort it was planned to run one convoy of three ships ashore in Suda Bay, relying on fire-fight-

ing squads to prevent their destruction by burning and on night clearance. It is very doubtful whether this would have been successful. Suda Bay had to be abandoned to the enemy before it could be tried.

The Heraklion sector never ran short of food and is believed to have been successfully supplied with some ammunition and medical stores by air, although the first delivery was dropped in the sea. In spite of every effort the situation at Retimo was not relieved owing to the enemy post astride the road just west of it. Several attempts at air dropping apparently failed, and in spite of every effort by the Naval Staff attempted delivery by boats and lighters also failed.

#### **The Withdrawal**

The New Zealand Division, although reinforced by the Suda Sector troops, was gradually driven back; Force HQ had to withdraw to Suda alongside the Naval HQ. It soon became apparent that Suda Bay could not be held, that evacuation must be the plan, and that the rescue of the garrisons at Heraklion and Retimo would have to be made direct by GHQ Mideast because there were no routes by which they could join the rest of the force. Heraklion garrison was successfully retrieved by the Royal Navy, who boldly sailed round to the port and got away, albeit with considerable casualties at sea.

The Retimo garrison, however, could not be reached in this way, and the plan for them to withdraw and cross the island to the southern beaches could not be carried out largely owing to poor signal communications. Eventually they were forced to capitulate.

The rest of the force, some 20,000 strong, composed largely of ill-armed or unarmed individuals, withdrew south from Suda Bay with evacuation at Sfakia as their objective. Except for the formed fighting units, the retreat developed into a continuous day-and-night march by parties,

in an orderly but determined manner, direct to Sfakia.

The enemy pursued hotly and managed to cut up many of the successive rearguards. Their air attacks, however, were luckily confined to daylight and not pushed home as strongly or as low as might have been expected.

#### Maintenance during Withdrawal

In the Suda-Maleme area maintenance of food and ammunition was achieved until the very last stage, when the sudden large-scale withdrawal, with evacuation from Sfakia as the objective, precluded adequate preparation. The last consignment of supplies and ammunition delivered by warship to Suda was cleared to Neon Khorion, which was the first planned staging area. To this place also some rations and petrol were pulled out from the Suda Bay depots, but the failure of lorries to return to the control of the RASC transport organization and the rapidity of the withdrawal through the Base Depot Area near Suda Bay made it impossible to form any dumps farther south on the Sfakia road from stocks existing in the north or delivered at Suda. It was hoped that all withdrawing fighting troops would bring back three days' ration with them. This they largely did.

The last alternative was to get supplies ashore at Sfakia from the ships arriving to evacuate personnel. In the first instance 15,000 rations were asked for in this manner, but the required quantity of balanced tinned rations was not delivered. Pack rations had not been devised in those days, and among the supplies put ashore in ships' boats were such useless items as sacks of flour. Clearance from the beach five miles uphill to the fighting troops had to be done by exhausted ill-organized men actually awaiting evacuation. Finally air dropping was arranged, but with little success owing presumably to the terrain, failure of recognition signals and general

lack of development of technique and equipment for this type of maintenance.

#### The Final Evacuation from Sfakia

Force HQ had withdrawn from Suda Bay, after a perilous bivouac for twenty-four hours under some trees on the southern shore, to some caves below where the road ended abruptly on the crest overlooking Sfakia. The rearguards were gradually pressed back to this crest. The Royal Navy on four successive nights did their utmost to evacuate the army troops, the few remaining RAF and their own small Naval element ashore. Successively, by means of ships' boats and one remaining landing craft, they cleared walking wounded, some British fighting and ancillary troops, the New Zealanders and the remnants of the Australian "brigade" from Suda—a total of some 12,000. Force HQ by direct order from the commander in chief, Middle East, withdrew in two Catalina aircraft on the third night. This evacuation was made possible by the absence of tide or heavy swell and casualties were obviated by the long, moonless nights, during which enemy aircraft remained on the ground. Finally, the remaining 8,000 were forced to surrender as much through lack of food as of armed strength to resist longer.

There was, therefore, a total loss, chiefly in prisoners of war, of some 12,000 army officers and men, but the enemy casualties in dead alone must have totalled more than half this number and the operation had cost them the cream of their existing airborne force both in personnel and aircraft. Except for a natural urge to get to Sfakia on the part of some units, who through lack of equipment could not take part in the actual fighting, the discipline and morale of all ranks were of the highest to the very end. Such uncontrolled marching on to Sfakia as took place was perfectly orderly. At the end the thousands who rightly feared that they would fall into enemy hands accepted

the situation with patient courage while they watched the more fortunate pass right through them to embark at the beach.

### Lessons

We nearly won the battle, as the Germans were on the point of abandoning their offensive. We did not win for the following reasons:

(a) The remnants of German paratroops in the Retima area established themselves astride the one Suda Bay-Canea-Retimo road and so permanently cut our lateral communications.

(b) We failed to mop up the first wave of German paratroops not only in the Maleme area but also in the area between Maleme and Suda Bay and just south of the Canea-Maleme road near Galatos. This was chiefly because we lacked artillery and a fully equipped mobile reserve.

(c) We ran short of supplies because we started with too little in reserve in the island; the troops from Greece brought nothing with them; all shipping had to be discharged at Suda Bay because there was no road right through to the beach at Sfakia, and the enemy aircraft were therefore able to bomb our port bottleneck.

In my opinion, in spite of having no aircraft, we should have held Crete if we had had the following:

(a) Four months'—preferably six months'—supplies of all kinds, including weapons and equipment, for the troops from Greece.

(b) A road right through to Sfakia, which could have been put through by a

field company in a month to six weeks with some road-making equipment.

(c) The following additional troops:  
One additional infantry brigade fully equipped with weapons and transport.

One divisional artillery.

One hundred more trucks (we had only twenty-seven).

As to control it is easier to be wise after the event. Cooperation with the Navy, the RAF and the Greeks was infinitely better than in Greece. On the other hand, organization of command was not sound, though it was difficult fully to realize this at the time.

(a) Force HQ should have been farther back and not at Canea. Suda Bay would have been better.

(b) There should have been one subordinate commander of the whole Suda Bay-Maleme area, with a local mobile reserve under command; Force HQ could have had a call on this reserve.

The following essentials were lacking in addition to stocks of supplies:

(a) Maintenance by air: there were insufficient parachutes available in the Mid-east and the technique of dropping supplies had not been developed.

(b) There were no fast ships available except the minelayer *HMS Abdil*. Had there been it would have been possible to maintain the force in Crete by sea at night through Suda Bay in spite of enemy command of the air.

(c) Pack rations were urgently required.

(d) Medical stores were the most serious and earliest deficiency.

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There are no longer any land barriers, ocean barriers or air barriers to separate peoples and nations. Air power has added the third dimension to war. Amphibious operations have made the oceans into broad highways.

Lieutenant General Raymond S. McLain

## Observing the Russians at War

Digested by the MILITARY REVIEW from an article by Lieutenant General Sir F. Noel Mason-MacFarlane in "The Journal of the Royal Artillery" (Great Britain) October 1947.

*While these notes of the author were intended primarily as additional comments on an article in the same publication by Lieutenant Colonel H. G. de Watteville, in April 1947, entitled "Russian Artillery—1941-1945" (digested in the January 1948 issue of the MILITARY REVIEW), they are also a valuable firsthand account of the military operations of the Soviet forces during the early part of World War II.—The Editor.*

ON 26 June (1941) I reached Moscow as head of the British Military Mission and remained in the USSR till the following May. My task was not made any easier by the fact that during the first year of the Russo-German campaign the Soviet authorities took a particularly poor view of our contribution to the war effort. No credit was given for our lone stand against the Axis. Neither the Battle of Britain, nor the extent to which we were containing the *Luftwaffe* in the West was really appreciated in Moscow. Our bomber offensive had not yet made its full weight felt. The second front, which was the one thing for which the Red army clamored, was still three years away. Lend-Lease was only in its infancy.

For these, and other reasons, it was hardly surprising that the Red army authorities, with their backs to the wall, were not as forthcoming as might have been hoped. Nevertheless, I spent an absorbingly interesting twelve months in the Soviet Union; and this year of first-hand experience has among other things, enabled me to recognize the futility of much that has been written about the Red army and the USSR.

### Russian Artillery

To start with, I doubt if it is correct to say that the Russian artillery was a

complete failure in the War of 1914-17. During my years in Hungary and Austria in the early 30's I met many officers of the old Imperial Austrian army who had fought on the Eastern front against the Russian army. Without exception they had been impressed by the performance of the Russian artillery in the early phases of the war. As time went on the Russian artillery, in the same way as the rest of the army, became less and less effective; but at the beginning of the war it undoubtedly gave good service at any rate in the central and southern sectors of the front.

The efficiency of the artillery of the Red army in the recent war owed much to the outstanding ability of General Voronov. Only once did I have an opportunity of a long talk with him but he left an indelible impression on my memory. Built on large and powerful lines, his personality was as marked as his stature. His technical knowledge was obviously of a high order. He was sound, very quick on the up-take and brimful of energy.

There is no doubt that the Germans allowed their artillery rearmament to lag behind their provision of dive bombers and tanks. At the beginning of the war the number of guns in a division was below standard European practice; and the rearmament of their field artillery with the 105-mm had not been completed. At the maneuvers in East Prussia, which I attended, in September 1938, the bulk of the field and medium artillery was of 1914-18 vintage.

### Trench Mortars

The Germans undoubtedly placed much reliance on the trench mortar as a supporting weapon for infantry; several Russian officers told me that the heavy trench mortar concentrations which were brought against them in the early days of the war



were devastating. On the other hand, I had an opportunity recently of discussing the early phases of the Russian campaign with a German General who had, at that time, commanded an infantry division; he told me that, as far as his division was concerned, he had had relatively little support from *Stukas*; he had made considerable use of his trench mortars, but it was his divisional artillery which had normally dealt with Russian resistance whenever this threatened to crystallize. He had been most impressed by the rapidity and accuracy with which his guns put down their concentrations. He was emphatic that he owed much of his initial success to his artillery.

Too little attention has been paid to the Soviet-Japanese clashes in Manchuria in 1938. The experience of modern warfare gained by the Red army, especially as regards the handling of tanks and their support, was considerable.

### Finnish War

I am also reasonably certain that the Soviet-Finnish war of 1939-40 was of far greater value to the Red army than is generally realized. The fact that the Red army took several months to overcome Finnish resistance led to many false deductions in foreign countries. It must be remembered that this campaign was fought on the narrow Karelian Isthmus in deep snow and under almost arctic conditions between the months of November and March. In winter-time in those latitudes movement off roads and tracks is almost impossible. Skis are of little use where there is no opportunity to maneuver. The Mannerheim Line was a strong prepared position, and there was no way round it short of a wide sweep round the north of Lake Ladoga which presented great difficulties in winter conditions; it took frontal punches involving very heavy concentrations of artillery fire to pierce it. These naturally took some time to mount, and in the meanwhile the Red army gained

much invaluable experience regarding winter clothing and equipment and the technique of winter fighting which stood them in good stead of their subsequent task against the Germans.

It is probably correct to say that it was not until the big Russian counter-offensive around Stalingrad that the Russians were able to produce a *decisive* weight of artillery support. But, in the course of a visit to a Red army division which was taking part in a successful small-scale counteroffensive northeast of Smolensk in August, 1941, I saw some of the country captured by the division; and the evidence of craters showed that supporting barrage fire by field artillery had been heavy and accurate.

### Transport Important

It goes without saying that the successes achieved by the Red army artillery in the later stages of the war could never have been achieved without adequate transport; I have always considered that of all the Lend-Lease provided for the USSR by the United Kingdom and the United States, the most valuable item was probably the vast number of trucks supplied by America. General Dean, who was head of the United States Military Mission in Moscow from 1943 to 1945, confirms this strongly in his very readable and informative book.

I am unable to throw any light on the ultimate organization of the Red army artillery. Up to the time when I left the USSR in May, 1942, there were few Corps Headquarters, and an Army Headquarters normally handled five or more divisions direct. The absence of integral corps artillery probably explains the formation of artillery divisions.

Press reports undoubtedly made frequent reference to Red army artillery firing over open sights. In the Soviet press, however, both in reporting their own operations and in detailing lists of equipment captured from the enemy, it was seldom that

any differentiation was made between guns and antitank guns. A large number of these reports probably referred to antitank guns, although there is no doubt that on frequent occasions they were very boldly handled.

I hardly think it correct to say that Red army artillery technique was not very highly developed. There may have been an absence of frills, but frills can be overdone. During both my visits to the front I was shown good maps with a 1,000 meter grid, and the artillery appeared capable of bringing down rapid concentrations effectively. I did not see any survey work in progress, but the fighting maps were clear, and target information, both from resection and from shooting and also from air and photographs was comprehensive.

#### Division Artillery

In the course of my visit to a division a few miles northwest of Vyasma I saw a good deal of the battery position area, and visited several batteries in action. There was little in the layout of the divisional artillery which was in any way abnormal. The guns were nearly all in shallow pits with only a limited amount of ammunition on the positions. Most communications were duplicated—line and radio—and in all cases which I was able to check speech was clear. All positions were heavily camouflaged with nets and foliage from nearby scrub. A representative of the Red Army Air Force was attached to divisional headquarters and all requests for air cooperation passed through him to the squadrons supporting the division. I was told that the time from a request for air assistance being initiated by a unit in the line to the arrival of the bombs on the target or the aircraft on its task was normally well under one hour.

My winter visit to the Fifth Army took place in February, 1942, when the leading divisions had just come up against a strong German position at Gzhatsk in their advance westward from Mozshaïsk. Condi-

tions were practically arctic, and deep snow made it impossible to move guns far from the main Moscow-Minsk road except on the few negotiable tracks. Large numbers of men were employed on keeping roads and tracks clear of snow, but there was a complete absence of snow plows although these were always to be seen in considerable numbers in Moscow. On the main Moscow-Minsk road I found the batteries of more than one division in action in positions close to, and on both sides of the road. They covered several kilometers of the road which was more or less in the line of fire. In the case of the mediums the guns were in action actually on the verge of the road, one behind the other. The whole area presented a wonderful target but, at that time, the Red Army Air Force had complete superiority over the *Luftwaffe* in this sector. Camouflage everywhere was white, and the parapets of gun pits were packed deep in snow which gives considerable protection against shell splinters.

#### Tank Defense

In dealing with German tank attacks the Red army definitely tried to canalize penetration as much as possible and to cover the "canals" with both antitank and field guns. Considerable use was also made of specially-trained personnel who lay up for attacking tanks with bombs. It was claimed that large numbers of enemy tanks were effectively dealt with in this way. I saw very few instances of the Red army using antitank mines, but my visits to the front were confined to sectors where they were on the offensive. The Germans employed these mines in large numbers, and their non-metal types, buried in the snow and proof against normal mine detectors were very troublesome.

#### Seasonal Armies?

I doubt the correctness of de Watterville's deduction that the Red army artillery, in common with the other arms,

was organized into two distinct seasonal armies for summer and winter work. I saw nothing to confirm this theory and I do not believe that there was adequate manpower or equipment for the purpose. The manpower resources of the USSR were, admittedly, vast, but for a variety of reasons the use made of man (and woman) power was far less economical than in our country or the United States. Clothing and paint undoubtedly changed with the season; but I am fairly certain that the men with white cloaks and equipment, skis and sledges and airscrew sleighs in the winter were the same as those who fought in different colors and camouflage in the summer. There was certainly no change in the width of tracks on track vehicles. Standard Russian tracks are very much broader than ours, as they have not only the snow of winter but the appalling mud and slush of the spring and autumn to overcome. In heavy going our Matildas and Valentines and carriers made a poor showing with their narrow tracks and low power-weight ratio in comparison with the Red army's tanks. Soviet tank design was based on the admirable formula—twenty horsepower for every ton weight of tank.

### Rockets

The only rocket projectile which I saw while in Russia was the type used by aircraft. This was already in production in the autumn of 1941. It was designed not only for the attack of ground targets, and especially armor and motor-transport, but was fitted with a time fuse for use in aerial combat. The rockets were fired electrically from slides attached to the undersurface of the wings of the aircraft. I saw these rockets fitted to both *Yak* and *Mig* fighters, and I also saw them at a later date fitted to Hurricanes which were left behind with the Soviet Air Force by the RAF wing which operated for a short time in the autumn of 1941 at Vayenga near Murmansk. Either four rockets with warheads weighing about twenty

pounds each or two with warheads of about forty pounds could be attached to each wing. Fired from an altitude of about 1,000 feet or less from an aircraft diving on its target, these projectiles were very accurate. I was told that against tanks very low altitude attacks at very short range were frequently successful. For use in air combat the fuses were preset to give an echelon of bursts over a predetermined range from the aircraft—e.g. an echelon of four or eight bursts between 200 and 400 meters. I understand that rockets of the same type were subsequently introduced for antiaircraft work and it was, presumably, on these that the design of the rocket projectile for ground use was based.

I never had an opportunity of seeing any Red army self-propelled guns, but at one time or another I came across most of their artillery weapons from antitank guns up to medium ordnance. All that I saw appeared to be of conventional design and, as was the case with most Soviet equipment, they were straightforward, robust and workmanlike jobs with a minimum of trimmings.

### German Failure

My personal opinion is that the principal causes of the German failure were as follows:—(1) The commencement early in November 1941 of a quite exceptionally severe winter more than a month before winter conditions usually set in. (2) The fact that the Germans fixed, or were forced by Mussolini's Balkan adventure to fix, their D-day too late. (3) The fact that the Soviet high command risked withdrawing more troops from their Far Eastern Army and produced a greater number of efficient reserves than the Germans thought possible. (4) The toughness of the Red army troops and the rapidity with which they profited by their war experience. (5) The inadequate preparations for warfare under almost arctic conditions made by the Germans, especially as regards winter

clothing. The fur caps, sheepskin coats, quilted trousers and, above all, the loose felt boots of the Red army gave them an immense advantage over their enemies. I was frequently told that the Germans lost 50 per cent or more of their fighting value whenever the temperature fell below -20 degrees Centigrade.

### Russian Manpower

The ultimate issue of the whole Soviet-German conflict was, to a great extent, decided by the holdup of the German advance in November 1941, and the German failure to secure Moscow and most of their pre-winter objectives. In the latter phases of the campaign, when Soviet manpower, determination and armament production, together with Lend-Lease, proved too much for the Germans with their colossal front and extended lines of communication, Hitler's refusal to sanction withdrawals, even of a minor tactical nature, contributed considerably towards defeat. This was stressed very strongly by the German divisional commander to whom I have previously referred.

I very much doubt if the German high command really failed to make a proper appreciation of Russian manpower or of the immense area and vast distances covered by the operations. They probably underestimated the extent to which the Red army had recovered from the effects of the great purge of 1937, and the good use which the Soviet authorities had made of their experiences in the Finnish war. There appears to be little doubt that the German high command and the German Embassy in Moscow were opposed to attacking the USSR in 1941, but the ultimate decision, as always, was Hitler's.

There is a widespread tendency to fail to realize that so much of the manpower of the USSR is not of genuine Russian stock. I have a vivid recollection of watching a Red army motorized formation passing through Moscow from east to west in the spring of 1942. Without exception

the personnel were of pronounced Asiatic type.

The extent to which the Soviet war industries had been established east of the Urals, and their productive capacity came as an undoubted surprise to the Germans and, in fact, to the whole world. The transfer to the east of machinery and munition workers from the areas threatened, and in many cases overrun, by the German advance was equally unexpected. As a result of the rapidity of the Red army withdrawal it was quite impossible to evacuate all the plant and staff involved. In many cases the works were abandoned and destroyed. But, wherever possible, trainloads of equipment and skilled workers pulled out on their eastward journey well ahead of the arrival of the Germans.

The manpower resources of the Soviet government were, naturally, immense. In this respect they had a great advantage over the Germans. But it would be wrong to assume that these resources were more or less inexhaustible. For a variety of reasons, mostly connected with the economic structure of the USSR, the Soviet authorities found themselves, in the later stages of the war, faced by considerable manpower problems although often in a different and less acute form than those of other belligerents.

### Antiaircraft Defenses

Little definite information came my way regarding the general air defense scheme and the antiaircraft layout for Moscow, except that the ground defenses were organized in four sectors. I was told that the tasks of night fighters and guns were coordinated but I was given no details. Night fighters were up during every raid, but not infrequently got out of their zones.

The Red army staff were uncommunicative on the subject of radar, but as far as warning was concerned the results, however achieved, were good; the sirens practically always gave from ten to fifteen

minutes notice of a raid coming in. No information was given me regarding radar stations, but on one occasion, flying low and off the normal route in bad weather a short distance east of Moscow, my aircraft passed over a station which bore a very strong resemblance, as regards its aeriels and layout, to the larger direction finder stations in this country. There was a wide observer network around Moscow, and an interesting feature of this system was the inclusion of personnel from anti-aircraft batteries of the Moscow defenses in observer posts some distance from the gun areas in the sectors involved.

### Antiaircraft

The Russian anti-aircraft batteries which I visited were mobile heavies in well protected positions in the inner ring of batteries in the northern sector of the Moscow defenses. I forget the exact caliber of the guns but it was about 80-mm. They were not the latest type of Red army heavy anti-aircraft; for one thing they lacked automatic fuse setters. There was nothing abnormal about the layout of the battery positions, and synchronization of lights and guns appeared efficient. The predictor appeared to be of Sperry type.

Night raids were dealt with by very heavy barrage fire. This was ordered and controlled by sector headquarters. In the first few raids every anti-aircraft weapon, whether heavy or light, seemed to be in action and the expenditure of ammunition must have been very great. Judged by their pyrotechnic results and by the relatively small damage done by the *Luftwaffe*, the deterrent effect of the barrages must have been considerable.

Normally all searchlights in at least one sector started sweeping just before or just after the sirens commenced. I frequently counted well over a hundred in action. Individual lights appeared to sweep an arc of about 15 degrees.

The Moscow defenses included a con-

siderable number of streamlined barrage balloons of sausage type, with sharply-pointed snouts, and they were normally up at night at heights up to, apparently, about 5,000 feet.

The gun and light defenses of Moscow were organized in two rings, the outer ring being well outside the industrial zone on the outskirts of the city and the inner ring fairly close around the city itself. A few heavy batteries were sited in the city area, and a great many light anti-aircraft guns were mounted on the roofs of big buildings.

Considerable use was made of camouflage in Moscow, particular attention being paid to the prominent western elevation of the main Kremlin building and to covering over complete sections of the waterways which formed easily discernible landmarks.

In various raids the *Luftwaffe* dropped large numbers of their normal type of small incendiaries. The speed with which these were extinguished was very striking. The fire-fighting organization in Moscow, and especially the roof watching, was extremely efficient. There is no doubt that a highly disciplined population is a great asset in the all-important task of organizing defense against incendiary raids.

### Winter Warfare

Perhaps a few notes on fighting in more or less arctic conditions may be of interest. I would say that there is little doubt that no army knows as much about this subject as the Red army.

Clothing is of paramount importance. The primary essential is that everything should be a loose fit. In the Red army the headgear is a fur cap with large ear flaps which tie under the chin. A thick, rough sheepskin coat, just short of knee length with a big collar, is worn over the field service blouse and warm underclothing and shirt. The trousers are made of quilted material—much the same as worn

in China—and are tucked into long felt boots which come almost up to the knee. Warmth around the knees, provided by the quilted trousers, is of great importance. The felt boots are of extremely loose fit and the Soviet soldier, in place of socks, wears a long bandage, about four inches wide, of flannel or similar material which he winds in a figure of eight around his feet and ankles. These boots are extraordinarily hard wearing and so long as the snow is dry and the ground hard they last extremely well. A pair of these boots properly looked after will last for more than one winter even though the sole, like the rest of the boot, is only thick felt. The non-skid quality of these boots on ice is also of great value. During most of the Russian winter, conditions are very cold and very dry, but in late autumn and early spring when the snow is apt to melt the Red army soldier has his ordinary boots with him for use as required. A scarf to wind round the lower part of the face including the nose is absolutely necessary. In really low temperatures only the eyes can be left uncovered. Gloves are a most important item. The outer pair has no separate finger compartments; the inner pair allows free movement to the thumbs and forefingers.

Fighting in three feet of snow and at very low temperatures requires a technique of its own. Off the roads and tracks sleighs and sledges must take the place of wheels, and movement dismounted, except on ski, is extremely difficult. It is impossible to carry on indefinitely in the open; rest and sleep are out of the question except in buildings and dugouts or other forms of cover which can be heated. Dugouts are difficult to produce as the ground is far too hard to permit digging. One alternative is to construct igloos of snow, lined, floored and covered with evergreen foliage. Another is to soften the ground by burning a large fire to permit

digging. Both in an igloo and in a dugout the warmth which can be generated by a small wood-burning stove and by the inmates packed like sardines is astonishing.

### Winter Tactics

Tactics in midwinter are largely effected by the possibilities of obtaining warmth and rest. So long as men are moving and fighting they can keep warm, but when they are exhausted they must have rest; and rest without warmth is impossible. Troops in the line, therefore, have to be relieved frequently to let them get back and rest, unless cover is available close at hand. Most local operations in midwinter were designed to capture a village or prepared position affording cover, after being taken, for the attackers. In taking on a village the Red army generally tried to infiltrate on ski on either side of it and surround it before the garrison could make their escape and set it on fire. In cases where they failed and the Germans burned the village, they generally got there before the fires had died down and they were able to commence digging at once in the ground thawed by the heat.

One of the main problems in winter fighting is keeping motor vehicles and tanks running. It is impossible, even with anti-freeze in the radiator, to allow a vehicle to stop, especially in a wind, without running the engine and moving it at frequent intervals. At night or when not in use, the Red army solved the problem very simply by lighting fires under the vehicle. In the case of a normal vehicle a fire is lit under the radiator and crank-case, one under the gearbox, and one under the back axle. For some unexplained reason this rarely results in setting the vehicle on fire.

I was somewhat surprised at the amount of information I was asked to acquire on every kind of subject connected with fighting in very low temperatures. The Red army were never very keen on providing



information about themselves, and having to approach them for information on anything that was not of immediate importance never helped matters. Considering the opportunities for studying arctic

warfare provided by conditions in Canada, I was not surprised that Red army officers often asked me what exactly was the difference between winter in Russia and winter in the north of Canada.

## Colombia's Air Force and Air Transport

Digested by the **MILITARY REVIEW** from an article by George M. Galster in the "Bulletin of The Pan American Union" January 1948.

COLOMBIA'S air transport industry, one of the oldest in the world, has grown so rapidly in recent years that the republic is faced with a serious shortage of pilots, air crews and ground technicians. Until now, the employment of United States and Canadian personnel has been a temporary solution to this problem. But, understandably, the Colombians are dissatisfied with this arrangement. They want to see local talent on the program.

Unfortunately, private flying never had a chance to develop in Colombia, and there is no reservoir of pilots for the job. There is only a handful of personal aircraft being operated in the country. The same conditions which make commercial air transport so necessary are chiefly responsible for this paradox.

Consider the geographical situation, for example. A relief map of Colombia shows three lofty cordilleras of the Andes fanning out from its southern border and running north throughout its territory. Isolated between these ranges, on tablelands 6,000 to 9,000 feet above sea level, are most of the larger cities. Surrounding mountains are usually crowned with a dense cloud layer. Unless the private pilot can operate expensive high-powered equipment, about all he can do is fly around his particular valley.

Thus, when the need for airline personnel became pressing several years ago, the government had only two choices: a

heavy subsidy for a new civilian aviation school, or the expansion of the air force training program and the release of pilots and technicians for airline duty. As the latter course seemed to offer more rapid results and tied in with the hemisphere defense program, new construction and equipment were immediately ordered for the air force college in Cali.

This school, named after Colombia's pioneer airman, Ernesto Samper, was originally organized in 1930, but graduated fewer than twenty pilots per year up to 1943. Now more than 100 students are enrolled, and the government expects to double this figure by next year.

The commanding officer of the school emphasizes that graduates are primarily air force officers while the majority are eventually released on a reserve status to the commercial lines, their training as military pilots remains paramount. The airlines are expected to handle their own on-the-job training programs, but company and military officials generally agree that the system as a whole is producing specialists of exceptionally high caliber.

The prospect of acquiring permanent, well-paid jobs with the airlines has naturally made the training course doubly attractive to Colombian young men. Most of them retain their initial enthusiasm throughout the course. With an ever-growing list of applicants, cadets are selected on the basis of a rigorous physical exam-

ination and aptitude tests. At the present time, a high school education is considered the academic prerequisite, but this level may be raised if recruiting efforts continue successful.

The officer in charge of flight training at the school has purposely scheduled a difficult primary phase that weeds out approximately 50 per cent of the original class. These students are then transferred

classrooms, sleeping quarters, a library, recreational rooms, dining rooms and an auditorium. All classrooms are equipped with the latest visual training aids, including sound movie projectors, and students spend many an extra hour studying the new working models of engines, propellers, and other hydraulic and electrical equipment. The Link trainer room is another popular place with students. Here



Colombia Air Cadets are quartered here.

at their own option to specialist courses in radio, navigation, operations, or meteorology. Basic and advanced flight-training phases for the remainder of the class are then covered through another six-month period. Students log about 300 flight hours during the course, which includes twenty-five hours blind flying. Night flying is also emphasized, as the government is rapidly installing airway beacons and lighting facilities at major airports.

The school also completed recently a new cadet building that is outstanding in design and utility. Large enough to care for all students, its facilities include

the students can ride in miniature aircraft and maneuver them in any type of simulated blind-flying condition without ever leaving the ground.

Cadets actually spend the greater part of their time in the classroom studying technical subjects. Yet students also receive an excellent background in social science, government, history, Spanish grammar, and English. In addition, all students are urged to participate in some competitive sport, of which football, baseball, and swimming are most popular.

Pilots are not released directly to the airlines upon graduation, but are assigned

to active air force units for a year or more to gain practical experience and build up more air hours. Maneuvers and routine flights are scheduled to all major fields in the country so that a thorough knowledge of local conditions is acquired. As the Colombian Navy has no air arm of its own, air force officers also receive training in seaplanes and large flying boats. In

one pilots and thirty-two mechanics, all Colombian air force veterans. The company has a scheduled cargo run to Quito, Ecuador, in addition to over 1,000 miles of domestic routes, and plans are being made for an extension to Miami. Hangars and shops are also being constructed for the company at Cali.

Still another group is planning a co-



Training planes at Colombia's Ernesto Samper Flying School.

addition, ten graduates are chosen each year to attend the United States Navy's cooperative training school at Corpus Christi, Texas. Former air force pilots have shown a healthy inclination to branch out for themselves in independent commercial airline companies. One of Colombia's fastest growing airlines, the Vias Aereas Colombianas (VIARCO), was started in 1945 by five air force veterans. Since then, their fleet has grown to seventeen Douglas transports plus two large amphibians. The pay roll now lists twenty-

operative airline enterprise with cattle ranchers in the isolated highlands.

One phase of the plan calls for periodically supplying individual ranchers with full-blooded calves dropped by parachute.

From all indications, Colombian air force veterans are destined for an important role in their country's economic development. Of even greater importance, they are showing that it is possible to forge a vital link in the hemisphere defense system while building a strong and independent air transport industry.

## Air Lesson in the Norway Campaign

Digested by the MILITARY REVIEW from an article in "The Aeroplane" (Great Britain) 25 July 1947.

MIS-TIMED, ill-equipped, and uncoordinated, the Norway Campaign of 1940 was the last attempt to land a British force on enemy-occupied shores without adequate air cover.

Except to those immediately concerned, the campaign was overshadowed by the retreat of the Allied armies in Europe and the subsequent threat of invasion to our own country. And it was these developments which caused the withdrawal of our forces from Narvik and brought the brief campaign to a close.

The Dispatch, "Norway Campaign, 1940," is in three parts. First is the Dispatch by Admiral of the Fleet the Earl of Cork and Orrery; the second is the "Report on Operations in Northern Norway from 14 April to 13 May 1940," by Major General P. J. Mackesy; and the third is the "Report on Operations in Northern Norway," from 13 May to 19 June 1940, by Lieutenant General C. J. E. Auchinleck. All three have this in common: that although they deplored the almost complete lack of air cover at all stages of the campaign, and all expressed appreciation at the efforts which were made by the very small air forces at their disposal, none of them considered the possibility of restricting the enemy's air activity by destroying him at his base. Strategic bombing was not even contemplated.

Admiral Lord Cork, in his dispatch, states that enemy air attacks began on the day the first convoy arrived and continued throughout the campaign from air bases in Trondheim and other places. Our Fleet Air Arm and RAF fighters, when they were available, wrought great havoc among them and afforded a very welcome relief. The provision of airdromes was a major problem and preliminary work was accomplished in clearing ground at Bar-

dufoss and Skaanland. The aircraft of *HMS Furious* operated to their full capacity when the bad weather allowed, but the ship was recalled to refit on 23 April.

*HMS Ark Royal* joined the force and her fighters had an immediate and noticeable effect upon the enemy's freedom of attack. The aircraft carriers *Glorious* and *Furious* arrived off the coast on 18 May and the 701st Squadron of Walruses flew off to Harstad, where they did useful work until the final evacuation, including a well-planned bombing attack on Solfolla.

### Gladiators at Bardufoss

The 263d Gladiator Squadron was flown ashore at Bardufoss from the *Furious* on 21 May. Sixteen machines landed, but three were lost. The *Glorious* had to return to the United Kingdom on account of shortage of fuel, and the *Ark Royal* also left for the United Kingdom on 21 May. On 26 May the *Glorious* was back and flew off the 46th Hurricane Squadron. One flight landed at Skaanland and the rest at Bardufoss.

Two flying-boats sent out to reconnoiter airdromes in the Bodo area were caught and put out of action on the water by enemy aircraft on 4 May. Enemy air power in the Bodo area steadily increased, but on only one occasion was it possible to hit back at them when, on 27 May, four of them were destroyed by two of our Gladiators.

The final operation for the capture of Narvik was planned for 27-28 May and began at 2340 on 27 May. At 0420 enemy aircraft put in their first appearance with some determined dive-bombing attacks upon the ships. This was followed by high- and dive-bombing attacks by aircraft working singly and in formation and at 0620 the flagship *Cairo* was hit by two light bombs causing damage and casualties. Our

fighters, "conspicuous and assiduous" in the patrol work until 0400, were after that time fogbound on the Bardufoss airdrome, some fifty miles distant from the scene of battle.

Describing the evacuation of northern Norway, which took place on five successive nights at the beginning of June, mainly by destroyers, Admiral Lord Cork states that up to the end air protection was afforded by the RAF and Fleet Air Arm in cooperation. Enemy dive-bombing attacks were made upon the *Störk* and the *Veteran* in Ofot Fjord on 7 June.

The last men to be embarked were the ground staff of the Bardufoss airdrome. The Gladiators had been embarked in the *Glorious*, but it was feared that the eight Hurricanes would have to be abandoned. "The courageous action of the pilots in volunteering to fly their machines on the flying deck of the *Glorious* resulted in all eight being got safely away—an achievement which deserved a better fate than that which befell the gallant men who had carried it out successfully." (The *Glorious* was sunk by enemy warships on her way to Scapa Flow.)

Lord Cork says that an outstanding combined effort of the three services was the preparation of the airdromes which included clearing the ground of three feet or four feet of snow. Although in the early stages there was no means of retaliation from air attacks, the Fleet Air Arm did all that was possible.

Major General Mackesy's report is brief and contains no reference to air support, although he stresses the importance of preventing the airdrome at Mo from falling into the hands of the enemy and allowing him to bring further air forces into action in the Narvik area.

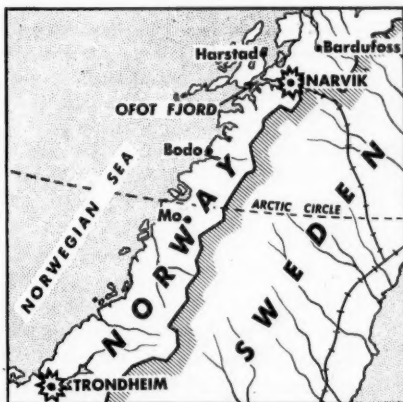
#### The Army's View

Lieutenant General Auchinleck, in his report, shows that he appreciated the need for the effective operation of an air component before he embarked and asked for

three airdromes with antiaircraft protection.

During the phase which preceded the establishment of land-based aircraft, the enemy carried out numerous attacks on shipping in the Ofot Fjord and off Narvik; on 20 May enemy bombers set fire to an oil tank at Harstad and two oil tankers.

General Auchinleck gave the forces he would require to maintain the integrity of northern Norway, and these included



two squadrons of Hurricane fighters, one bomber squadron, and one army cooperation squadron. The Chiefs of Staff reply was that owing to events in France and Belgium only one Hurricane, one Gladiator and possibly one army cooperation squadron would be available.

The position on 13 May was that the Germans had powerful air forces in southern Norway and several excellent air bases from which to operate. We had not a single landing ground fit for use. The enemy thus had complete mastery in the air except for the somewhat rare occasions when the Fleet Air Arm were able to intervene with carrier-borne aircraft.

The report describes the difficulties of preparing landing grounds in mountainous country under deep snow, and says

that although the need for air support was urgent, all pressure to call for aircraft before the landing grounds were ready to receive them was resisted.

### Superiority of the RAF

Once established, the RAF soon proved its superiority over enemy bombers and fighters, and the comparative immunity from air attack enjoyed by the forces during the later phases of the campaign was due to the severe losses inflicted by our aircraft on those of the enemy.

The duties of the air component were:

- (a) to protect from hostile air attack the Naval anchorages at Skaanland and its approaches, the base at Harstad, Allied sea and land forces in contact with the enemy, and airfields occupied by the RAF;
- (b) the primary aim of fighter aircraft

should be to destroy enemy aircraft approaching the areas to be protected; (c) to cooperate closely with the land forces.

In his general survey of the events between 25 May and 2 June, General Auchinleck says that our fighter aircraft were exceedingly active and caused heavy casualties to the enemy. The Hurricane squadron which arrived on 26 May was based with the Gladiators at Bardufoss after a failure to base it at Skaanland. Enemy activity in the air was heavy at first, but decreased owing to the activity of our fighters. They managed, however, to crater the new landing ground at Bodo, damaged the *Southampton* and *Cairo*, destroyed the *Curlew* and caused the mobile base ship *Masobra* to be beached and eventually lost.

The ground soldier who can use the vehicles of the sea and air forces to reach his arena, and then live, fight and maintain himself through weeks and months of hard weather and campaigning is, in this age more than ever before, the keystone of armed effort. But his mission is no longer an end in itself except, for instance, on an air-borne drop to seize or destroy a strategic interior point that is invulnerable to air attack and beyond the range of sea-borne weapons or amphibious assault. The ground soldier is now only one member of a team. His role is: first, to make possible; and second, to complement the roles of the air and naval members.

*General of the Army Dwight D. Eisenhower*